Vol. XVIII. PEAR GROWING. Part 2.

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The Journal of the Department of Agriculture of Victoria, Australia.

February, 1920.

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THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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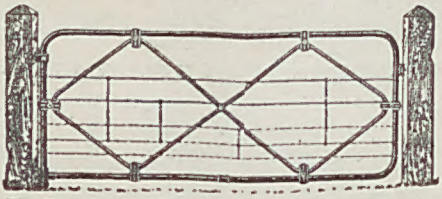

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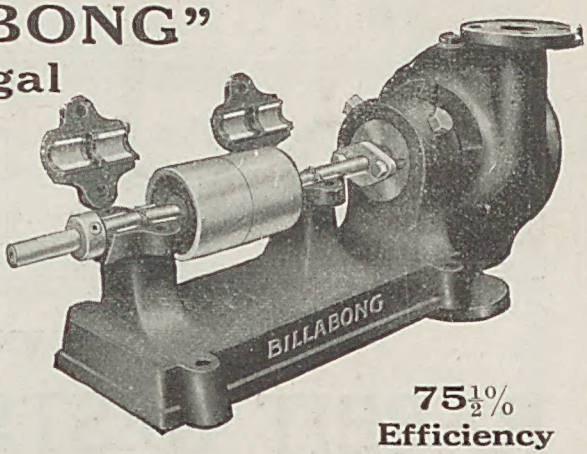

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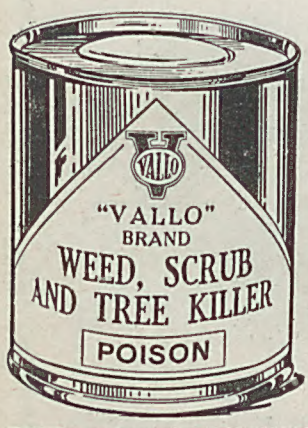

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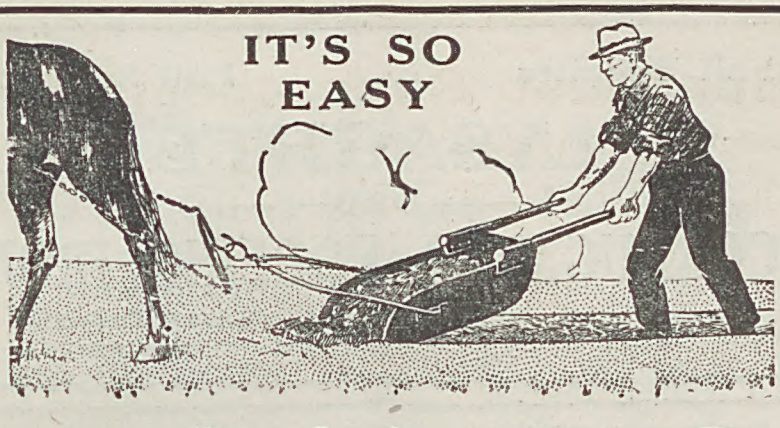

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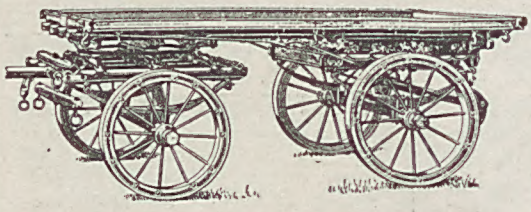

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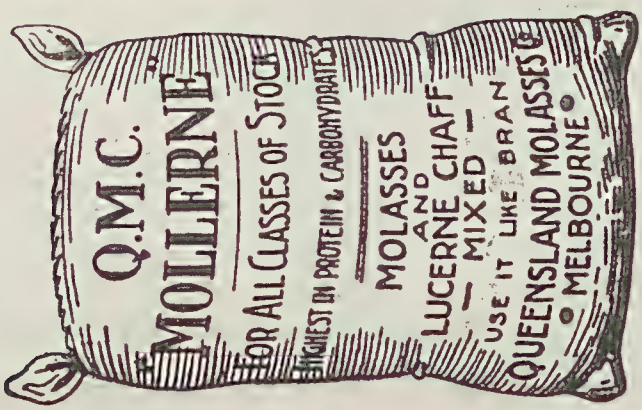

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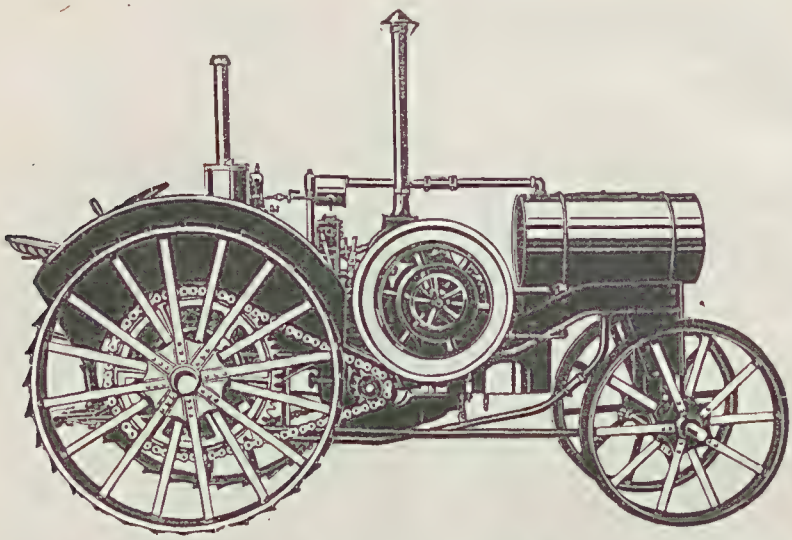

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THE JOURNAL

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Department of Agriculture

OF

VICTORIA.

Vol. XVIII. 16th February, 1920 Part 2.

THE BEET SUGAR INDUSTRY.

By W. L. Williams, Manager, Beet Sugar Factory, Maffra.

PART II. (continued from p. 15.)

Beet Seed.

Supplies of high grade beet seed have always been procured from Europe, but during the war seed was most difficult to secure, prices advanced fourfold, and the pre-war standard of quality was not retained.

Quality is all important to the factory, but the Maffra growers are not yet directly interested, because they are paid a flat rate for their beets regardless of quality. When the industry is more fully established there is little doubt beets will be purchased on a basis of sugar content.

Beet seed may be satisfactorily grown here, but the maintenance and improvement of its sugar-producing propensities is a most elaborate business, demanding exceptional care and heavy outlay that may only become justified as the beet sugar industry develops and creates a reasonable local demand for beet seed.

Science has perhaps affected the characteristics of the sugar beet more than those of any other known plant. Originally an annual, it has been influenced to develop sugar the first season, and defer seeding until the second, thereby improving its opportunities for the development of sugar, and lengthening the term for its extraction.

Little over a century ago the plant yielded about 5 tons per acre of beets containing 5 per cent. of sugar. By most rigid selection and careful breeding the sugar beet now yields from 10 to 20 tons per acre, and the beets test normally 15 per cent. to 16 per cent. of sugar, and sometimes reach as high as 25 per cent. of sugar. Such beets would naturally revert to a much lower standard very rapidly if not persistently and scientifically cared for.

Without entering into the elaborate details of high grade beet seed production, the following will be sufficient to indicate that beet seed growing is an important industry which cannot safely be trifled with.

(1) Specially selected super-élite pedigreed seed is planted towards summer. In the autumn every beet therefrom is carefully tested physically and chemically, and those few passing the rigid tests are siloed or stored.

(2) In spring of the second season the stored mother beets are again submitted to physical and chemical tests, and planted to produce in the autumn a crop of super-élite and élite beet seed.

(3) In spring of the third season the élite seed is planted, and but lightly thinned to secure long, small, mother beets called "stecklings," which are lifted in autumn and siloed.

(4) In spring of the fourth season the "stecklings" are planted, and produce a crop of commercial seed in the autumn.

(5) In spring of the fifth season this commercial seed is planted, and produces beets in autumn for the manufacture of sugar.

Beet Plot at Maffra Factory.

Every year the super-élite seed must be carefully selected for the foundation of a new series. Germany and France in particular have specialized in the production of high grade beet seed, and owing to the difficulties occasioned by the war America has gone rapidly, largely, and no doubt successfully into the business.

In this district the factory has had to content itself with catch crops of beet seed. A reasonably high-testing plot of beets is reserved through the winter, and the roots are replanted the following spring as mother beets, yielding a crop of seed which is used commercially. This seed production has been very successful, the cleaning of the seed rather difficult, but the method of course is not safe. It has served a useful

purpose while European seed has been so hard to secure, and the seed is probably more virile than the imported, but to continue on these lines would adversely influence the sugar content.

If élite seed were procurable from year to year the factory could produce its supply of commercial seed which would have the advantage of being acclimatized, but it is unlikely that any reliable firm could be induced to part with its élite seed.

While the quality of the seed is so supremely important to success that no factory should even think of purchasing any but the very best, it is remarkable how climatic conditions may influence the sugar content of beets and sometimes bring unjust criticism on the quality of the

Weighbridge at the Maffra Factory.

seed used. As an example a set of results is submitted for comparison of Maffra results against Western District. The seed used in both districts was home grown, and produced at the Maffra factory from a French strain of seed. The season 1918-19 at Maffra was exceptionally dry right throughout the growing period and the beets were stunted. At the usual time of maturity heavy autumn rains set in, and the stunted beets took on a second growth with a lowering of sugar content and purity to such an extent that the average sugar content for the whole of the season's beets at Maffra was only 13.49 per cent. The Western District beets evidently enjoyed a fairly normal steady growth throughout the summer, being favoured with the usual coastal showers. The beets consequently received no serious setback, and came

steadily to maturity, resulting in a much higher sugar content than the Maffra beets produced from exactly the same line of seed.

Maffra Home-grown Seed.

Sugar Content Influenced by Climatic Conditions.

Plot No.	Location.	Topped Beet.	Sugar.	Purity.*	Sugar Content per Acre.	
	1918–19.	Tons per acre.	Per cent.	Per cent.	Tons.	
1	Maffra	15	14·0	80·6	2·10	Abnormal climatic conditions; unsteady growth
2	„	15	14·4	81·1	2·16	
1	Port Fairy	20	18·0	90·6	3·60	Fairly normal climatic conditions; steady growth
2	„	18	18·4	86·6	3·31	
3	„	19	17·2	91·4	3·27	
4	„	11	17·2	91·0	1·89	
5	Warrnambool	17	19·0	88·6	3·23	
6	„	24	20·4	89·8	4·89	
7	„	23	18·4	88·1	4·23	
8	„	18	19·0	86·5	3·42	
9	„	13	20·0	89·1	2·60	

* High purity favours a high extraction.

The production of single germ beet seeds is receiving a lot of attention in America, because such seeds would economize the cost of thinning considerably, and there seems every reason to believe that such a characteristic may be developed and fixed in course of time.

Imported sugar beet seed a few years back could be distributed at 6d. per pound; recently it has cost in some cases as high as 2s. 6d. per lb., and is now being distributed to growers at 1s. 6d. per lb.

New Beet Sugar Factories.

The location and construction of a new beet sugar mill calls for a lot of forethought and consideration, yet one is safe in saying that there is only one thing that need very seriously exercise the minds of those interested—"an assurance of a satisfactory supply of beets from year to year." This is most essential, and if assured an up-to-date efficient mill has no excuse for anything but success.

The supply of raw material is so important that no district should consider the beet sugar industry without reasonable proof that the soil and growers are capable and willing to produce plenty of beets. When the farmers have promised suitable support in the way of raw material, which is more important than cash, then the promoters should secure independent rights over a few thousand acres of land to balance results against the natural inclination of many farmers to follow occasional high but varying priced crops. Frequently they follow such fancy crops one year too late. Furthermore, industrious beet labourers and newcomers sometimes desire, to launch out as beet growers, and the factory can then accommodate them with land at reasonable rates; whereas uninterested land-owners are often disposed to force rents up unreasonably. The factory needs to regulate its supply, and to encourage growers to grow beets as profitably as possible, and a substantial area of land in the hands of the promoters to be sub-leased on easy conditions and cropped on a rotation basis is a great advantage and necessary to balance the production from year to year.

Capacity of Factory

(advisable for present Victorian conditions).

A factory capable of treating 500 tons of beets per day is desirable. America tried European methods and small capacity mills, and practically all of these failed financially, because America had to face high costs for labour and material. Very much improved labour saving and larger capacity plants were then tried, and T. G. Palmer, a noted sugar authority says:—"To-day a 500-ton factory is regarded as the minimum sized factory for profitable operation in America." These efficient plants have invariably made good wherever the supply of beets

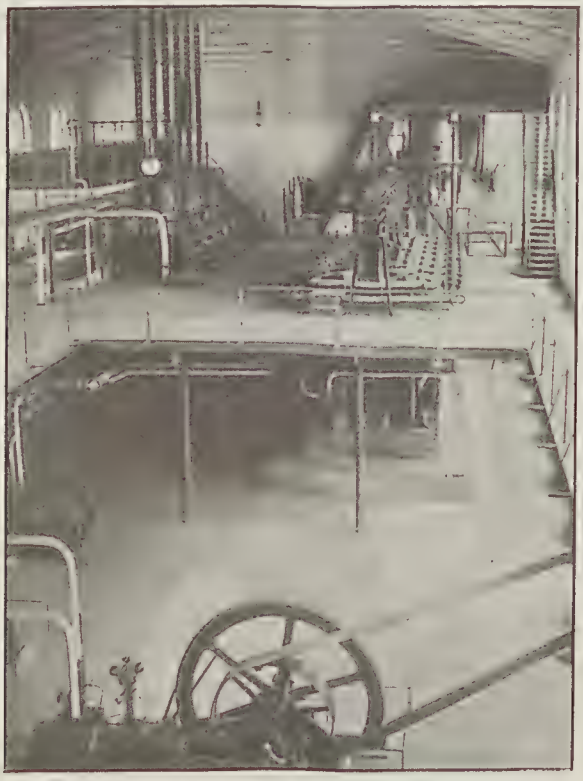
Special Beet Train at the Maffra Factory Bins.

has been satisfactory. A majority of American mills treat 1,000 tons per day. At the same time it is not advisable to have the capacity of a mill ahead of the quantity of beets readily available within easy distance.

To satisfy a 500-ton mill 4,000 acres of beet is desirable, but the first season both growers and factory would be better served to start off with a smaller acreage well cared for, as it is a crop that demands good and very prompt attention at certain stages. Inexperienced growers and labourers would be more worried over half the area the first season than the full area after experience.

Cost and Factory Requirements.

Under present conditions it is impossible to make anything but a vague estimate of the cost of a 500-ton mill. Probably £150,000 plus working capital, plus sundry beet loading and railway facilities might be required, and undoubtedly a large part of the plant could be made in Australia to advantage. This would be a heavy outlay, due to the prevailing high costs, but running at capacity such a mill would directly employ 600 men in field and factory, and be of interest to a



View of Beet End at the Maffra Factory.

very large number indirectly. Also at capacity it should annually produce sugar, &c., to a value approaching the factory cost of £150,000.

40,000 tons of beets would cost	£60,000	
Manufacturing costs, repairs, &c. (estimate) ..	45,000	
Other costs, including management, interest and depreciation (estimate)	20,000	
Operating costs		125,000
Value of products, sugar, &c. (say)		145,000
Balance		£20,000

The running costs and value of products are liable to much variation, and should only be taken as a very general indication of results. For safety the above valuation of products has been taken at a low figure.

A supply of 3,000,000 gallons per day of good water would be required during the operating period.

Five thousand to 6,000 tons of coal would be needed per annum.

Fifteen hundred to 2,000 tons of high-grade lime rock.

Large quantities of sugar bags, cotton filtering material, coke, manufacturing supplies and beet seed would also be necessary.

A factory site should be central to the beet areas, convenient to railway service, well drained, and such that surrounding areas could be irrigated with the waste waters if necessary.

The value of the industry to its district and the State is best measured by the amount of employment and the wealth it may produce and distribute per acre of land involved.

General Information.

America has nearly 100 beet sugar factories producing about 800,000 tons of sugar, while cane interests represent about 250,000 tons, but America's home requirements are over 4,000,000 tons per annum, made good by large supplies from adjacent cane sugar producers, mainly from Cuba. America is now learning to appreciate the many economic advantages of producing as much home-grown sugar as possible, and, realizing the improvement in agricultural methods due to sugar beet growing, the Government is doing its best to encourage expansion.

The demand in America as in Australia and elsewhere seems likely to keep well ahead of available supplies, and the *per capita* consumption is certain to increase with the improved living conditions and the realization that sugar is one of the very cheapest forms of energy-producing food. The heat units of sugar amount to 1,814 per lb., which is very much ahead of most other foods, and distinguishes it as a particularly valuable energizing substance. At 3½d. per lb. this "concentrated sunshine" is probably the cheapest and pleasantest means of developing and maintaining human energy.

The *per capita* consumption of sugar prior to the war in some of the principal countries was approximately as follows:—

Country.	1913–14.
	lbs.
United States	89
England	93
Germany	45
Austria-Hungary	29
France	44
Russia	25
Italy	12
Australia (1918–19)	120

The world's production of sugar has shown a steady increase, but recently the demand has outstripped the supply which has been steadied

by the war. With a strong demand and many European beet sugar factories destroyed the production is not likely to fully satisfy the growing demand for some years to come.

World's Sugar Production.

Year.	Cane.	Beet.	Total.
	Tons.	Tons.	Tons.
1850	1,200,000	200,000	1,400,000
1860	1,341,000	450,000	1,791,000
1870	1,741,000	846,000	2,587,000
1880	2,027,000	1,820,000	3,847,000
1890	2,443,000	3,669,000	6,112,000
1900	5,959,000	5,944,000	11,903,000
1910	8,566,814	8,503,970	17,070,784
1914–15	10,165,700	8,216,800	18,382,500
1915–16	10,675,700	5,032,000	15,707,700
1916–17	11,383,800	5,673,200	17,057,000
1917–18	12,505,800	5,050,600	17,556,400

The world's requirements are now computed to be 21,000,000 tons, plus a substantial annual increase for the future.

The production and consumption of sugar in Australia since 1911 has been approximately as follows:—

Australian Sugar Production.

Period.	Production.	Consumption.
	Tons.	Tons.
1911–12	190,595	233,000
1912–13	129,877	241,000
1913–14	265,029	255,000
1914–15	245,876	264,000
1915–16	159,640	262,000
1916–17	193,037	266,000
1917–18	327,589	274,000
1918–19 (estimated)	199,000	279,000
1919–20 (estimated)	155,000	285,000

With a growing population and demand there is scope for increased production.

Apart from its direct worth in sugar the beet sugar industry has been responsible for a notable and favorable influence on the agriculture of every country where it has been established. Both France and Germany largely put the beet crop in place of a bare fallow in their rotation system, and secured, in addition to the sugar, improvements up to 100 per cent. on the yield of grain crops so influenced. Australia's wealth and strength undoubtedly depend on the rapid and intense development of her rural interests, and the sugar industry, cane or beet, is capable of playing a most valuable part in such development, because it demands intense culture, and produces so much wealth per

acre. Australia's sugar bill will soon exceed £10,000,000 per annum, an amount much better spent in Australia than abroad.

Some Difficulties.

Against the beet sugar industry and many other industries the Australian frequently shows an inexcusable amount of prejudice and lack of patriotism, due undoubtedly to a form of national modesty which causes him to denounce local products and praise imported. A little pride and confidence in our own products may be a wonderful stimulus to help increase production and improve the quality of our goods.

Constantly one finds people declaring that beet sugar is useless for jams and preserves, and it is quite refreshing to read a recent report on "Why English confectioners prefer beet sugar to cane for high grade confectionery!" The reasons are substantial and interesting, but too lengthy to review here. In general, Europe has always held a splendid reputation for the quality of her confections, preserves, jams, and condensed milk manufactured almost entirely with beet sugar. Chemically refined beet and cane sugar cannot be distinguished one from the other. They both adhere to the one chemical formula $C_{12}H_{22}O_{11}$. It may be sometimes possible, but by no means certain, for manufacturers to distinguish by the grain. Housewives need have no anxiety in using beet sugar. Europe has given it 100 years successful experience. America has made elaborate and definite tests with both sugars, and could find no difference in the results of the preserves and jams so tested. If the home-made jams and jellies fail it is due either to faulty methods of manufacture or more likely to the fruit. Wet season fruits are far less favorable in quality than those matured under sunny conditions, and variations in quality can only be partially corrected by special care in boiling. If the fruit or boiling is faulty it does not seem right, though it may be convenient, to blame the sugar, which in itself is quite pure.

Even the land-owner frequently takes a delight in declaring that sugar beet growing ruins the soil. In correct farming it can and does actually "improve" the soil. It certainly absorbs a lot of moisture, but that does not impoverish the soil because it is constantly being replaced. From a sugar production point of view the beet is simply a plant developed in the soil to manufacture sugar from constituents not of the soil. $C_{12}H_{22}O_{11}$ signifies a combination of water and carbon. The beet leaves play a most important part in the production of sugar. They are studded with "stomata" or breathing pores which breathe in carbon dioxide from the atmosphere, assimilate the carbon and set free oxygen. Under the influence of the green colouring matter of the leaves of chlorophyl and sunlight, the carbon dioxide combines with water in such a way as to form probably glucose first, then starch, gradually liberating the oxygen. Starch is insoluble, and is transformed into sucrose and glucose, and conveyed in solution to all parts of the beet plant to aid its development and towards maturity to store a liberal supply for the subsequent reproduction of the plant by developing seed. By harvesting the beets at maturity this seeding function is intercepted, and the stored sucrose is manufactured into commercial

sugar for human consumption. Thus is energy actually won from the atmosphere and stored in the beet as sugar or "concentrated sunshine," becoming available under manufacture as a most valuable energy producing food. From this it may be understood that the actual sugar in the beets does not in any way rob the soil of plant food. The plant itself absorbs a quantity of plant food, but with correct farming a great part of this may be restored to the soil in excellent form for subsequent crops. The tops and crowns which contain the bulk of the plant food may be ploughed in or fed off and the manure ploughed in. The pulp containing the balance of the plant food may also be fed to stock and returned in the form of manure. However, the great reasons for the improvement of the soil by beet growing are—

1. The persistently intense deep culture demanded by the beet crop invariably improves the texture and productivity of the soil.
2. The deep rooting disposition of the sugar beet causes it to throw down a deep tap root, under examination found to be massed with fibrous roots. These roots and countless rootlets reach to depths quite unusual with most crops, and greatly enrich the soil by bringing up fresh supplies of plant food from the subsoil to the surface soil. At the same time they open up and aerate the subsoil, and add a mass of humus in the form of root matter which gives life and vitality to the soil, and is so essential to fertility.

Both consumers and producers of beet sugar might reflect on these matters, because practice as well as knowledge indicate that the industry is worth commendation rather than prejudice.

Regarding the Maffra beet sugar industry it must be borne in mind that the mill was constructed over twenty years ago when manufacturing labour and materials were cheap. With this same plant, after lying idle for ten years and with no important improvements, the Department of Agriculture has made a clear demonstration that beet growing and sugar manufacturing may under Victorian conditions be quite congenial, profitable, and of great advantage to its district.

It has shown that a substantial rainfall or irrigation is necessary.

It has also shown that with success comes the tendency for landowners to make it difficult for growers to secure sufficient land at reasonable rates. Although the factory's substantially capitalized plant, forced to operate on a small acreage with increasing costs of labour and material, has shown a degree of success and a satisfactory demonstration, it is not to be expected that the industry can expand and take its rightful place as a vigorous industrial proposition without sufficient land to produce a satisfactory supply of raw material. Granted such, the Mill, in order to cope with the supply and contend with high costs, would, as a matter of course, be remodelled and brought up to efficiency on a 500-ton per day basis to the advantage of producer, worker, and consumer.

As a business proposition the Maffra factory or any other Mill that may develop needs control of a substantial acreage of good land, suitable climatic conditions, and an efficient plant.

CROP AND FALLOW COMPETITION, DIMBOOLA, 1919.

Report by the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer, Department of Agriculture.

I have much pleasure in forwarding my report as judge of the local Crop and Fallow Competition recently conducted under the auspices of your Society. In so doing, may I be permitted to commend the Society for its progressive action in resuming this class of competition after a lapse of some years. There is, I believe, no more effective way in which the Society can assist agricultural advancement in the district, unless it be the widening of the scope of the present competition to cover the entire farm, as was once the practice.

Each year Dimboola farmers are slowly but surely adding to their knowledge of the methods which give the heaviest yields of wheat. Some farmers, however, consistently grow better crops than their neighbours, and on land of so uniform a character as the black, fertile Wimmera plains, that there can be usually only one reason for the difference—it lies in the farming methods. How often does it happen that a wire fence is all that separates land growing 10-bag crops from that growing 7?

On the face of it, there would seem to be no reason why this state of affairs should continue, but the difficulty is that the good men do not advertise their methods, and their less successful neighbours are not easily convinced. Indeed, the latter are quite justified in treating isolated instances of the apparent success of new-fangled notions with some caution. It would be a different matter if systematic information were collected each year on the methods by which the best crops in the district were grown. Then any well-corroborated instances could be presented with added weight.

At present it is nobody's business to collect and prepare such information and pass it on for the public good. In America, and some of the advanced agricultural countries of the world, work of this kind is done under the County Agent system; but, in the absence of that, may I suggest to your Society that the Crop and Fallow Competitions might be utilized for the purpose. The experience at Nhill over the past 20 years certainly shows the plan to be feasible and the results valuable.

The collection of the information necessarily involves the inspection of a number of the crops, a decision as to which are best, the collection of details of the methods of growing crops, the elimination of disturbing factors affecting fair comparisons, such as soil, the uneven distribution of the rainfall, and past history of the field, &c.; all of which fall naturally within the scope of the duties of a judge of a competition of this character.

Such information has been systematically collected at Nhill, and issued annually in printed form by the Society, and having special local interest, it has been a potent agent for the rapid spread of sound agricultural practices in that district.

The Season.

The season has been the driest recorded since the 1914 drought, only 13¾ inches of rain having been registered at Dimboola. It was,

however, sufficient to grow good crops of wheat where attention was paid to the careful working of the fallows and the seeding made reasonably early. As elsewhere in the Wimmera, a considerable proportion of the rain fell in February and March (4.48 inches), outside the growing period of the crop. Where this rain was carefully conserved, it had a vital bearing on the yield of the crop.

Numbers of farmers were deterred from entering the competition on account of the dry season—a regrettable fact, because the peculiar conditions this year offered a unique opportunity for the gleaning of valuable information on the methods that were most satisfactory under dry conditions.

The presence of such a small field of competitors practically precludes sound deductions being made from a comparison of the individual methods.

Mr. E. Schaefer's Mallee Crop of Red Russian.

Results.

Section I.—For Best Growing Crop of 150 Acres of Wheat Grown on Mallee Land by a Farmer Owning 640 Acres of Land or over.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	35	20	15	15	15	100
E. Schaefer	Red Russian ..	15	18	10	12	14	69

There was only one competitor in this section.

The fallow upon which the bulk of this crop was grown received the following treatment:—In 1917, the paddock was in oats. In the following July, it was ploughed with a mouldboard plough to a depth of 3½ inches; it was then harrowed. In September, the paddock was scarified, then harrowed, and again scarified before harvest. After harvest the land was harrowed, scarified after the March rain, and re-scarified in May in front of the drill, and sown in mid-May with 60 lbs. seed and 60 lbs. manure. The variety, Red Russian, was relatively true to type. In a second paddock of the same variety, which

had two less workings and was not sown until 15th June, the yield was not within a couple of bags to the acre of the first-mentioned. A little ball smut was present.

Section III.—For Best Growing Crop of Wheat of 100 Acres Grown on Mallee Land by a Farmer Owning not more than 640 Acres of Land.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
J. Glatz	Federation .. Red Russian .. Penny ..	19	16	13	12	14	74

Mr. J. Glatz's Mallee Crop of Red Russian.

There was only one competitor in this section. The crop was, nevertheless, of a high standard of excellence, and there was no smut.

The fallow on which the crop was grown was ploughed early in June to 3½ inches. Before harvest it was scarified and harrowed twice. After harvest it was scarified in March after the rain, and then scarified, harrowed, and drilled in early May. This crop was sown with 1½ bushels of wheat and 112 lbs. of superphosphate, and its appearance is just one more instance of many this year which should banish for ever the theory that in a dry year heavy dressings of "super." burn off the crop. Mr. Glatz's experience in this respect is similar to that of a large number of Wimmera farmers, and is in thorough accord with the results obtained at the Government experimental plots at Longerenong.

The heavy seeding is also of interest, because of the strong tendency there is among Wimmera farmers to increase the amount of seed sown per acre. This year could well be looked upon as a critical test for such a practice. It is interesting to recall that Mr. R. Blackwood's second-prize crop at Nhill was sown with 1¼ bushels of seed and 112 lbs. of superphosphate; and the third-prize crop with 80 lbs. of seed and 90 lbs. of superphosphate. Several of the heaviest crops in the Minyip and Rupanyup districts were also sown with 75 to 80 lbs. of seed and 90 to 100 lbs. of superphosphate.

It should be borne in mind, however, that these results were achieved in every case on well-worked fallow, where there were naturally increased supplies of moisture and plant food available for plants to utilize.

There is no justification for the increase of seed on badly-farmed land, where, on the contrary, it might prove detrimental.

SECTION V.—FOR BEST GROWING CROP OF WHEAT OF 150 ACRES, GROWN ON LAND OTHER THAN MALLEE, BY A FARMER OWNING 640 ACRES OF LAND OR OVER.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	35	20	15	15	15	100
T. E. Moller	Federation ..	13	17	6	9	12	57

There was only one competitor in this section.

The paddock upon which the crop was sown was, in 1917, under wheat, which yielded 11 bags to the acre. The stubbles were burnt. Between July and August it was ploughed, harrowed twice with the scarifier-harrows, then scarified and lightly harrowed. After harvest it was scarified in February, and then in front of the drill. The sowing took place in the first week in June, and the paddock was harrowed after the drill. Sixty pounds of seed were used, and 75 lbs. of superphosphate. The variety was Federation. Mustard and wild oats were present, and the crop was smutted.

SECTION VII.—FOR BEST 100 ACRES OF GROWING CROP, GROWN ON LAND OTHER THAN MALLEE, BY A FARMER OWNING NOT OVER 640 ACRES OF LAND.

Name.	Variety.	Yield.	Purity and Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Possible Points ..	.. .. ..	35	20	15	15	15	100
P. H. Müller ..	Federation .. Penny ..	23	17	14	13	14	81
A. A. Moller	Federation	19	16	..	11	14	60
H. Budde	Federation ..	11	15	7	9	10	52

Mr. P. H. Müller's winning crop was a very creditable one for the season. There were two varieties—Penny and Federation. The Penny was the better of the two; it was true to type, and very well headed. Both crops were even and level. The only disease was a little Flag Smut or Black Rust.

The following treatment had been given:—In 1917, the paddock was in oats, which was cut for hay. It was fallowed to 4 inches with the mouldboard plough in August, then harrowed twice. It was scarified at the beginning of October, and harrowed three weeks later. The paddock was harrowed, and spring-toothed in February after rain; subsequently, it was scarified, drilled, and harrowed at the end of May and beginning of June with 65 lbs. of seed and 90 lbs. manure.

The fallow on which Mr. A. A. Moller's crop of Federation was grown was ploughed somewhat later. It received seven workings in

all. It was sown at the same time as Mr. Müller's with 75 lbs. of seed and 80 lbs. manure. The crop had been fed off. It was smutted.

Mr. Budde's crop of Federation was sown about the same time on July fallow which had in all six workings, including the ploughing. The crop was thin. It had been inadvertently pickled too heavily, which killed a large percentage of the grain; but, even so, smut was present, precaution not having been taken to dip the seed and remove all floating scum and smut balls by skimming.

Summarizing the Results.

Crops.—The inspection of the crops submitted for competition has impressed me strongly that there is need for paying stricter attention to the care and attention of the seed wheat used at Dimboola. I do not think it reflects credit on an up-to-date farming community that there should be only two crops in the competitions quite free from smut. There is no doubt that there is something radically wrong with the method of pickling generally adopted locally. It appears to be one in which a certain allowance of bluestone is made for each bag of wheat pickled, without due regard for the amount of water used, or the length of time the pickle is in contact with the wheat. A fertile source of infection is the failure to take systematic precautions to remove unnoticed smut balls that may happen to be present in the seed. Seed known to be smutted should, of course, not be sown.

There is only one method that has proved uniformly successful in the prevention of smut. The pickle must be weighed, the water measured, the time of contact must be definite, and provision be made to remove any stray smut balls in the seed. The standard strength of pickle is 1½ lbs. of bluestone dissolved in 10 gallons of water, or 1 lb. of formalin dissolved in 45 gallons of water. The seed should be poured into the pickle, and any scum or smut balls which float after stirring removed. The immersion should be for not less than three minutes, and not longer than four minutes. There are several types of pickling machines which are specially designed for this work, but there are other sorts which are not so effective. In the absence of a good pickling machine, each bag should be broken into two or three butts, and these should be dipped while open, and after vigorous rinsing, skimmed of rubbish while still submerged in the pickle.

There is also the need for the wider introduction into the district of improved strains of existing varieties of wheat. At the State Experiment Farms, this work is carefully carried out, and considerable improvement in the yielding powers has resulted. Attention has been especially concentrated on Federation, with the result that this variety so improved has been proved at Longerenong College to yield, over the last six years, an average of 6 bushels to the acre more than the strain from which it was derived. Federation is rightly the favorite variety grown at Dimboola, but there are other varieties, such as Penny, Yandilla King, &c., which have their place on every farm. The place for these slow-maturing varieties is at the beginning of the seeding season.

On well-worked fallow, the use of 1 cwt. of superphosphate to the acre could be made routine practice. Not only will the additional manure pay for itself and yield an average extra profit of 3s. 6d. to 4s.

per acre, as it has been shown to do year in and year out at Longerenong, but the feed on the stubble paddock is proportionately increased—an important consideration at the present time.

It is only by careful attention to each one of these departments of wheat-raising that the maximum profits are made.

In addition to special attention to the seed and the application of heavy dressings of superphosphate, another important factor in raising the maximum crop year after year and still maintaining fertility of the land is the growth of oat crops systematically over the farm in rotation with wheat, as often as can be arranged.

The Up-to-Date Residence of Mr. T. E. Moller, Dimboola.

Fallows

The most important consideration of all has been left to the last—that is careful cultivation of the fallows, and it must be admitted that the majority of Dimboola farmers rightly pay particular attention to working their fallow land. It is somewhat doubtful, however, if the full significance of the working is always appreciated. The primary object of fallowing in the Wimmera is to store moisture in the ground and make it available for the crop next year, thus supplementing the rain which falls during the growing period of the crop. The average rainfall in the Wimmera is only sufficient by itself to produce a five-bag crop. In this case, about 4 inches are actually utilized by the crop, the rest passing away as evaporation from the surface, or by percolation into the depths of the soil. It has been proved at Longerenong that, by carefully working the black soil after each rain, an extra 4 inches can be conserved in the subsoil; *i.e.*, on the normal rainfall, a 30-bushel crop is possible.

The effect of working after rain is to lessen the evaporation from the surface of the soil by the creation of a blanket of loose dust. The average farmer cultivates his paddock mainly to kill weeds. At the same time, he conserves moisture; weeds, therefore, are, strangely enough, something of a blessing in disguise.

It is well established that early fallow is the best fallow. After the ploughing, the main object of the farmer—apart from killing rubbish—should be to create a fine mellow mulch or layer of loose soil from 2½ to 3 inches deep, over a firm, moist, well-consolidated soil underneath. The implements should never be allowed to sink to the original depth of the ploughing, because there is a tendency of the black soils in that case to dry out and refuse to adhere, thus producing a loose seed bed, so detrimental to wheat. The working of the fallows during summer after rain with a light implement, such as harrows or spring-tooth cultivator, is especially important. Every working is worth at least a bushel or two of wheat.

Last year, the heavy summer rain was literally worth bags of wheat to those who carefully conserved it.

The secret of the successful cultivation of black land in the Wimmera is to do the necessary operations at the right time. If worked on the dry side, the fallow can never be induced to assume that fine mellow appearance which, to the experienced eye, betokens a capacity for high yields of wheat. In an adequately-mulched fallow of this description, it is always possible to obtain the soil at a foot below the surface in a sufficiently moist condition to mould with the hand.

Results—Fallows.

Section II.—For Best 150 Acres of Fallow on Mallee Land Exhibited by a Farmer owning 640 Acres of Land or over.

Name.	Character of Soil.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. .. ..	25	25	25	25	100
E. Schaefer	Red clay loam ..	18	18	24	20	80

There was only one entry in this section.

The fallow was rather on the rough side and unevenly cultivated. It was ploughed in July to 4 inches. The land was on the dry side when broken up, so that it had to be ploughed somewhat deeper than is usual for this class of land. In the spring, it was scarified and subsequently harrowed, then scarified again.

Section IV.—For Best 100 Acres of Fallow on Mallee Land Exhibited by a Farmer owning not over 640 Acres of Land.

Name.	Soil.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. .. ..	25	25	25	25	100
J. Glatz	Red clay loam ..	20	20	25	24	89

There was only one entry in this section.

Mr. Glatz showed 130 acres of fallow, which was fairly high in moisture underneath, though it was drying out because the surface mulch or blanket of loose soil was on the thin side. The cultivation was otherwise exceedingly well done. The paddock received the following treatment:—It was ploughed in June to between 3 and 4 inches, and harrowed immediately afterwards. In August it was scarified and harrowed again; subsequently it was scarified and harrowed twice, once in the beginning of October and again towards the end of that month.

There was an absence of weeds. Last year the paddock grew a crop of wheat. On the whole it was an excellent piece of fallow.

Section VI.—For Best 150 Acres of Fallow Land, other than Mallee, Exhibited by a Farmer owning 640 Acres of Land and over.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. ..	25	25	25	25	100
T. E. Moller ..	Black, red patches ..	20	20	24	23	87

There was only one entry in this section.

This fallow was in very fine condition, though somewhat rough on a red bank. The moisture was very fair, though rather deficient owing to the ploughing having been left till August and September. The mulch was deep and mellow, and there was fair consolidation underneath.

Portion was ploughed in August, then scarifier-harrowed twice. Subsequently it was scarified, and then given a light stroke with ordinary harrows.

The remainder was not ploughed until September, and then received similar treatment.

Section VIII.—For Best 100 Acres of Fallow, on Land other than Mallee, Exhibited by a Farmer owning not more than 640 Acres of Land.

Name.	Soil.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. .. ..	25	25	25	25	100
P. H. Müller	Black, red patches ..	21	24	25	24	94
H. Budde	,, ,, ,, ..	22	23	20	20	85
A. A. Müller	,, ,, ,, ..	19	21	20	19	79
W. Elsom	,, ,, ,, ..	22	23	17	15	77

Mr. Müller's fallow was in excellent condition. The moisture had been conserved by the provision of 2½ inches of fine mellow mulch overlying a moist, firmly consolidated seed bed. There was a complete absence of weeds, and the cultivation implements had worked evenly and straight.

The paddock was ploughed in July to 3½ inches; it was then harrowed twice in August. It was scarified in the beginning of October, and harrowed at the end of October.

Mr. Budde's fallow showed a higher moisture content; the mulch was deep and mellow. The cultivation had not been so effectively done, especially on the red ground, and the oats were showing green. The paddock received four workings, including the initial ploughing in July.

. . . . . .

In conclusion, I have to thank the Secretary, Mr. Bennett, and Mr. Schultz (who provided the car), for their courteous assistance during the work of judging.

A royal decree has recently been made by the Italian Government to provide for the necessity of increased agricultural production, with special reference to cereals, vegetables, and edible tubers. It had been felt in many quarters in the country that proper use was not being made of large tracts of land which had never been placed under cultivation, owing to the difficulties raised by the land-owners in granting leases on adequate terms and to the indisposition of land-owners or the State to sink any capital for the development of such land. Expression to the prevalent feeling of dissatisfaction was shown on the 24th August by the organized seizure by a number of farmers of tracts of uncultivated land in 200 localities in the vicinity of Rome, chiefly at the instigation of the "League of Fighting Soldiers."

It was to deal with the situation thus created that the Royal Decree was issued. Under the decree farmers belonging to legally constituted agrarian associations are secured in temporary occupation of land concerning which questions of civil custom have arisen, for a period of four years. The land-owner is to receive fair compensation, and when this cannot be decided by common agreement the matter will be determined by an arbitration committee. There is a right of appeal against a decision by this committee. Under certain provisos, framed in the best interests of land cultivation, application may be made before the termination of the provisional occupation for the occupation to be made permanent.

The decree also provides for the granting of State assistance where it is considered desirable, empowers agrarian societies to collect from their members payment due in respect of incoming subscriptions, repayments, &c., on the principle of the collection of direct taxes, and makes the Minister of Agriculture responsible for the supervision of agrarian associations and bodies.

—*Journal Board of Agriculture,* England.

PEAR GROWING IN VICTORIA.

(Continued from page 669.)

By E. Wallis, Orchard Supervisor.

Fencing the Orchard.

Before the young trees are planted they should be treated so as to give them protection later from hares, rabbits, and other vermin. In order to minimize the expense of establishing the orchard, some growers endeavour to protect the trees by limewashing, coating them with liquid manure, or by tying bark or rushes round them. At the best, these means afford only partial and temporary results in the way of protection. It is better for the prospective grower to incur the extra expense of providing a vermin-proof fence at the outset, which is the most reliable and permanent means of protection it is possible to provide.

If trees be placed in their allotted positions in the orchard without such an adequate safeguard irreparable damage to them is often caused, and thus all the previous preparatory work is rendered useless.

The succulent cambium of the pear wood is singularly attractive to both hares and rabbits, and in order to obtain it they will gnaw away the outer bark, and probably kill the trees they attack.

A fence constructed of posts, wire, and wire-netting will prove the most satisfactory safeguard against vermin, and may be made of posts split from durable bush timber, and placed in the ground 7 or 8 feet apart. Five wires should be used, three of No. 8 fencing wire and two of barbed wire, the latter being placed about 6 inches apart at the uppermost part of the fence. Commencing about 6 inches below the bottom barbed wire, the three plain wires should be equi-spaced, and will act as a support to the wire-netting, which should be 3 ft. 6 in. wide, with an inch and a half mesh. The netting should be sunk 6 inches in the ground on the outside of the fence to prevent rabbits from burrowing underneath.

Well constructed gates, with sound, heavy posts, to prevent the gates from sagging, are essential in order to prevent any entrance of vermin at these places.

Laying Out the Orchard.

Every effort should be made in planting an orchard to see that at the outset it is well laid out, so that it may become an ornament instead of an eyesore to the district in which it is situated. The trees should be so arranged that from all angles the rows will be truly in line.

For all practical purposes the square system is the best. By this system it is not possible to plant so many trees per acre as with other methods, such as the quincunx; but if trees are planted 20 feet apart, 108 trees will be grown to the acre, and it is not wise to tax the land to any greater extent. This fact is evidenced by the extensive root ramification of well-developed trees, the roots of which extend in all directions over the whole area at their disposal when planted as suggested.

To set out an orchard for planting on the square, straight parallel lines equi-distant from each other are marked off, and are intersected by other parallel lines the same distance apart running at direct right

angles. The point of intersection is the position for each tree, as will be seen in the diagram, Plate No. 35.

In starting to peg out the orchard, different systems may be adopted. A method commonly used is to first obtain a straight base line by means of sighting poles about 6 feet long, with white paper wrapped round them to insure easy vision, and by using a rod of desired length to measure distance for pegs. A fairly satisfactory result may be obtained in this way by those experienced in the work, but a better plan is to use a measuring wire instead of the rod, as this insures rapidity and accuracy not possible in the other way.

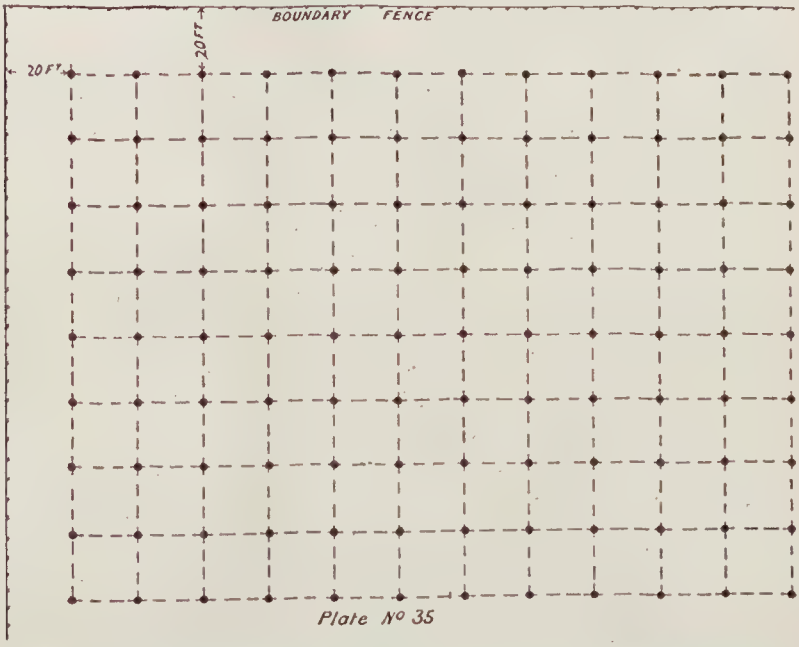


Diagram of an area pegged on square 20 ft. x 20 ft., with headland of 20 ft., showing how 103 trees to the acre may be planted.

The measuring wire should be made of No. 10 gauge galvanized wire of sufficient length to measure the longest row. An iron ring 3 inches in diameter is fixed to each end of the wire. One ring is placed on a bar or stake driven into the ground, and the wire stretched tautly to its full length, and the ring at the other end fixed in the same way. The measurements along the wire should be accurately made, allowing for an overlap of 4 or 5 feet at each end of wire between ring and first mark on the wire. Commencing then at a point, say 4 or 5 feet from the ring, a piece of copper wire is wound round the measuring wire and soldered into position. This plan is continued every 20 feet, or whatever distance between the trees has been decided upon. The use of copper wire for markings is preferable to paint, as the latter is liable to rubbed off, and copper markings will be as readily visible as paint when pegging is being done. In Plate No. 36 an illustration of a planting wire made as described is seen.

With such a wire the base line is easily established. If the headland is to be 20 feet—and it should not be less—the distance decided upon is measured off from the fence and the measuring wire fixed in position. The line may now be pegged off, a peg being driven into the ground at each mark on the wire.

After the base line is established and pegged off, the next step is to place the measuring wire at a direct right angle to the base line already established. Taking the fence as a guide is not always reliable in establising the right angle, but it may be obtained in a simple way by adopting the method generally used by builders and others, *i.e.*, the 3—4—5 principle, as shown in the diagram (Plate No. 37). By multiplying this ratio by twenty we have 60—80—100, which may be more conveniently used in long measurements, and facilitate accuracy.

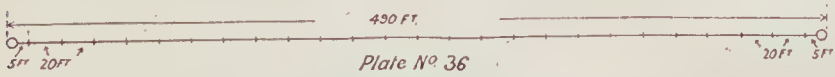


Plate No. 36

Measuring wire marked off at intervals of 20 feet with overlap at each end between ring and first peg-mark.

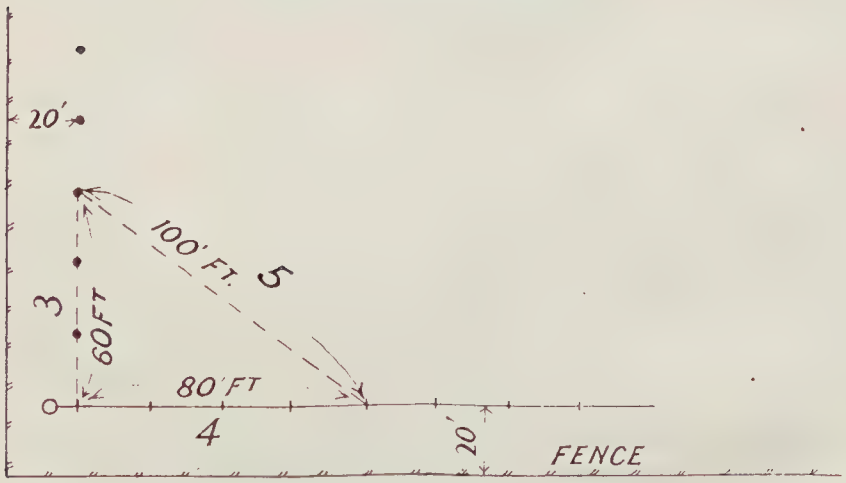


Plate No. 37

3, 4, 5, Method of Finding the Right Angle.

Therefore, after the wire is removed from the base line, already established, it is stretched out and fixed tentatively at an approximate right angle to the base, taking the fence as a temporary guide. If we now measure off 60 feet (fourth peg, including corner peg) on the base line and 80 feet on the measuring wire, the distance between these two on the triangle should be exactly 100 feet. If not correct, the necessary adjustment may be made by shifting the temporary line accordingly. Plate No. 37 shows the details as described.

When the right angle is accurately obtained, the pegging of this line is proceeded with, as in the case of the base line. After this is completed, the other end line and fourth line of the rectangle are completed in the same way. No difficulty should then be experienced in

setting out the remainder of the stakes, as there is a check peg at each end and on each side, as seen in Plate No. 38. Should the land be of an undulating character, it will probably be found necessary to resort to sighting the pegs into their correct positions where decided undulations occur, as in such a case the measuring wire may prove deceptive. It is, however, well to set out as much of the area as possible by means of the measuring wire, and, after this is done, to complete the pegging out of the uneven part of the land by sighting. When the area is inconveniently large, it will be found easier to do the work of setting out in sections, running a line through the centre of area each way to insure accuracy.

Plate No. 38

Showing Method of Pegging-out an Ordinary Rectangular Area.

Selection of Varieties for Planting.

In making his choice of varieties for a commercial pear orchard, the prospective pear-grower should have a definite object in view as to the markets he intends to supply, for indiscriminate planting will do much to make the business of pear-growing anything but profitable. This is so because certain markets have a decided preference for certain varieties. For instance, one variety may be highly suitable for either local or Inter-State trade, but not at all suitable for overseas export, whilst for canning purposes special varieties are required. Thus it will be seen that, in order to cater specially for a particular market, those varieties which are most suitable for the purpose will need to be planted.

Another and important factor to be considered when planting is the matter of inter-pollination, and with some varieties it is quite essential to inter-plant another variety of simultaneous blooming habit in order to secure profitable crops of pears. As this aspect of pear growing is of

such vital importance to insure success in the business, it will be dealt with under its own heading later on in this article.

From statistics of average yields already quoted from other States, and also from America, Victoria need not fear comparison with these places, but the aim of pear-growers should be to maintain, and even increase, the standard in this State.

In regard to quality, the pear-grower is fortunately assisted materially by the climatic conditions obtaining in Victoria, and, therefore, if the right varieties are planted, and subsequently receive the necessary attention in other details of orchard practice, there is little to fear as to the success of the business.

Unfortunately, amongst the earliest ripening pears there is none which can be classed as a good quality pear, and most of them ripen so quickly that they have to be handled very promptly in order to place

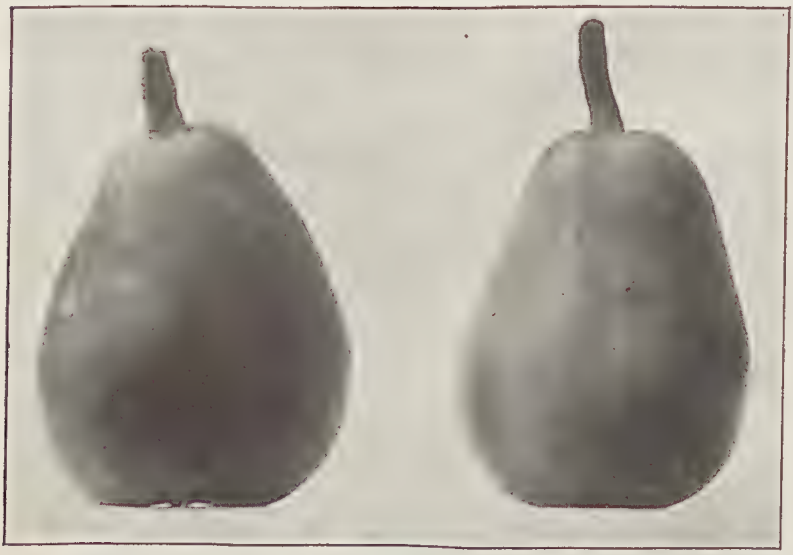


Plate 40.

Clapp's Favourite. Brockworth Park.

them on the market. Perhaps the earliest pears of value are Brockworth Park and Clapp's Favourite, the latter being, in the writer's opinion, the better of the two. If picked at the proper time, *i.e.*, when hard and just as the fruit is on the turn from the green to the ripening stage, this variety may be ripened by the third week in January in the south of Victoria, and probably two or three weeks earlier in the northern parts of the State. It is a very handsome pear when ripe, being pale lemon colour, with a rich red blush on the part exposed to the sun. Although not a good keeper, the quality is good, and payable prices are obtained either locally or as a pear for Inter-State trade. Illustrations of the two pears mentioned are shown in Plate No. 40.

Williams' Bon Chretien is perhaps the best known of all varieties, and ripens about two weeks later than Clapp's Favourite, with which it corresponds in type. Souvenir du Congress and Packham's Triumph

Plate No. 43.—Howell.

Plate No. 42.—Souvenir du Congress.

Plate No. 41.—Packham's Triumph.

are also of the same type of pear, and, in fact, by flavour and texture alone, it would be rather difficult to discriminate between any of them, although they differ in appearance and also in their suitability for canning and cool store purposes.

If Williams' Ben Chretien possessed the quality for cool storing of many other varieties, it could be classed as an ideal pear to plant for all markets, but, unfortunately, it cannot claim this distinction. Consequently it should be disposed of while in a hard condition either for canning or dessert purposes. If allowed to become at all ripe, it is often found necessary to sacrifice it at unpayable prices.

Packham's Triumph ripens three or four weeks later than Williams' Bon Chretien, and is a first class dessert pear. It has come into prominence of recent years owing to its fine quality and suitability for cool storing. It should prove a good export variety.

In order of ripening, Howell follows on Williams' Bon Chretien. If picked while it is hard, but just on the turn of ripening, this pear

Plate No. 44.—Gansell's Bergamot.

ranks as one of the best for cool storing, but, if allowed to become at all ripe on the tree, soon goes bad in the centre, and is quite unsaleable. If managed in the proper way, however, this pear develops a fine quality, and has proved very profitable for both overseas and Inter-State export trade.

Beurre de Capiaumont is a well-known pear of medium quality, of distinct cinnamon colour, and rather astringent flavour. It is a popular variety for Inter-State trade.

Gansell's Bergamot is a well-known English pear, of good quality. The texture is rather granular, but the flavour is rich and aromatic. It is suitable mostly for local markets. Beurre Bosc, Josephine de Malines, and Winter Nelis are three of the finest quality pears grown, and ripen in that order. Each of them is highly suitable for the overseas export trade, and all usually bring high prices late in the season on the Sydney and Brisbane markets. It will be found on referring to the records of prices obtained in previous export seasons that these

pears have proved highly remunerative, and, being good keepers (especially the latter two), they stand the irregular temperatures which may be experienced on the voyage better than most other kinds.

Beurre Clairgeau and Broompark are also good export varieties, and the latter, with Winter Cole, are much in demand for the Inter-State trade. If sent to Sydney and Brisbane in September and October, highly payable prices are generally realized.

A pear that is not very well known, but which is an excellent quality pear, is Beurre d'Anjou. This pear is fast coming into favour, and as it keeps well will doubtless prove a profitable variety to grow. It is an early bloomer, and ripens about the middle of April.

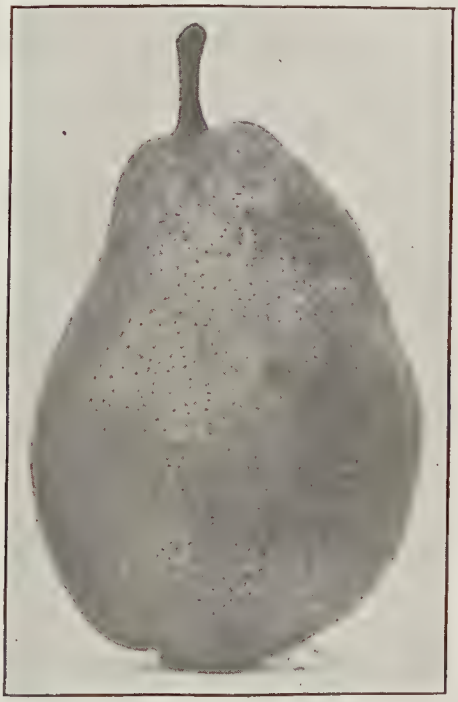


Plate No. 46.—Harrington's Victoria.

Vicar of Winkfield and Harrington's Victoria are two good culinary pears. Although the former does not, as a rule, bring high prices on the local market, it has in the past proved profitable for export. The latter is a Diamond Creek seedling, and owing to its late keeping qualities and suitability for culinary purposes usually brings good prices late in the season.

Black Achan is also a first class pear for culinary purposes, and is very popular for local trade.

Lawrence is another pear not well known, but with its fine, rich, aromatic flavour it is safe to predict that it will become popular in the future. This variety also is an early bloomer, and ripens fairly late.

Kieffer is a well-known variety, singularly adapted for canning purposes, but also useful as a culinary variety. When allowed to ripen it develops a rich pineapple flavour, and the texture, which is coarse when green, becomes fined down considerably, and then makes a good dessert pear. A pear of all-round quality, it is undoubtedly a profitable variety to grow.

In concluding the consideration of individual varieties which the writer considers the best, it should be understood that there are other varieties which also may be ranked as good, but over which those mentioned should take precedence.

The varieties already discussed will be found enumerated in the following table, which will give the reader necessary details concerning each variety, such as time of blooming and ripening, quality, and markets best suited to each variety:—

Variety.	Time of Blooming.	Time of Ripening.	Quality.	Markets.
Beurre Bosc ..	Late ..	Medium	Very good	Local and general export
Beurre Clairgeau ..	Early ..	Medium	Medium	Local and general export
Beurre de Anjon ..	Early ..	Late ..	Very good	Local and general export
Beurre de Capiaumont	Medium	Medium	Medium	Local and Inter-State export
Black Achan ..	Medium	Late ..	Good ..	Local
Broompark ..	Late ..	Late ..	Good ..	Local and general export
Brockworth Park ..	Early ..	Early ..	Medium	Local
Clapp's Favourite ..	Medium	Early ..	Good ..	Local and early Inter-State export
Gansell's Bergamot ..	Medium	Medium	Good ..	Local
Harrington's Victoria	Early ..	Late ..	Good ..	Local and late Inter-State export
Howell	Early ..	Early ..	Good ..	Local and general export
Josephine de Malines	Medium	Late ..	Very good	Local and general export
Kieffer	Early ..	Late ..	Good ..	Local, Inter-State, factory
Lawrence	Early ..	Late ..	Good ..	Local
Packham's Triumph	Medium	Medium	Good ..	Local and general export
Souvenir du Congress	Medium	Medium	Good ..	Local
Vicar of Winkfield ..	Medium	Medium	Good ..	Local and general export
Williams' Bon Chretien	Late ..	Early ..	Good ..	Local, Inter-State, factory
Winter Cole ..	Medium	Late ..	Good ..	Local and Inter-State export
Winter Nelis ..	Medium	Late ..	Very good	Local and general export

Doyenne du Comice and Glou Morceau are not grown to any extent in Victoria, but are favourite export varieties in other States.

In making a selection of pears to plant from this list, the market objective is the first consideration. For instance, if the prospective grower intends to grow varieties principally for general export purposes he should choose those kinds which have proved profitable in this branch of the business.

Probably the six best overseas export varieties are:—Beurre Bosc, Beurre Clairgeau, Broompark, Josephine de Malines, Packham's Triumph, and Winter Nelis.

For Inter-State trade:—Beurre de Capiaumont, Broompark, Howell, Josephine de Malines, Kieffer, Winter Cole.

For canning:—Williams' Bon Chretien, Kieffer.

Local market:—General varieties.

Unless the grower specializes in canning varieties under contract to jam factories, he will necessarily have to cater principally for the overseas export trade, or for the Inter-State market, or both, for the local demand for pears, apart from canning, is not in any way comparable with that in the northern States and overseas markets. As, however, we can produce pears of the highest quality in Victoria, it is the pear-

Plate No. 47.—Beurre D'Anjou.

grower's business, not only to cater for, but to also develop, those markets already established.

Dessert pears should not be too large, and should be juicy, sugary, melting and highly flavoured. Culinary pears should be large, juicy, firm, and crisp. For canning purposes it is essential to have varieties which remain white in colour after canning instead of changing to pink or red, as is the case with the majority.

(To be continued.)

THE NECESSITY FOR TOP-DRESSING PASTURES

By Edward Murphy, Dairy Supervisor.

The maximum returns from a minimum of labour are secured in dairy farming where there is a profusion of good meadow grasses to which cows may help themselves. In that stretch of country between Warrnambool and Port Fairy such rich grass lands are to be seen, and it is in about the centre of this area—at Dennington—that the Nestle Company has its huge condensery, which is fed by milk depôts in the surrounding district. Some idea of the quantity of milk treated at the condensery is given by the fact that its annual requirement of sugar is about 9,000 tons, and another condensery is about to be constructed for the Nestle Company at Allansford.

No. 1.—The Farmstead, Nestle's Concentrated Milk Company, Dennington.

A great deal of the surrounding district was at one time considered unsuitable for dairy farming, but it has been shown that it can be made productive by the use of phosphatic fertilizers. Unfortunately, this improvement is restricted to a comparatively limited area, and on big tracts of country the pasturage has, owing to neglect and bad management, deteriorated. Though these areas cannot compare in natural fertility with the land at Dennington and Tower Hill, they could, by attention to the underlying principles of growth, be transformed into good dairying land.

Compared with other countries, much of the Australian surface soil is weak in lime and phosphorus, or in phosphorus only. In consequence, grasses have become predominant in which the content of such minerals is low, and on such grasses milch cows cannot maintain a proper balance of the essential elements in their systems.

To keep their cows alive, many farmers resort to laborious hand feeding instead of improving their pastures by top-dressing them with phosphate. Nothing is so costly as ignorance, and at Hamilton it has been the cause of a fair-sized butter factory dwindling away to a small cream depôt for a metropolitan firm.

Merely spelling the fields will not suffice. Graziers often tell me that their paddocks will grow only "dead" grass, on which cows get paralysis

and sheep become weak and liable to worms. Regulation of the grazing on these depleted soils can only avail in so far as it promotes the growth of deep-rooting grasses in order to tap the reserves of mineral nutrients in the subsoil. The growth of such plants does not readily come about while the surface of the soil is unfavorable to their re-establishment.

The Department of Agriculture is conducting some trials in top-dressing natural pasture on a block close to Hamilton, which will be fully reported at a later date. At the commencement of the trials, the grass in the lower end of the plots was tufty, long, and harsh. On the untreated portion, it is still the same, but where lime and superphosphate have been applied, the tufts have turned green to the very tips, and the growth of trefoil and clover has been astonishing. On the untreated soil, a few feet away, one has to look very closely to see any clover or trefoil. This experimental block is part of a holding upon which milch cows did very well forty years ago, but of late years there have been losses, and cows can only be kept alive by liberally feeding bran and

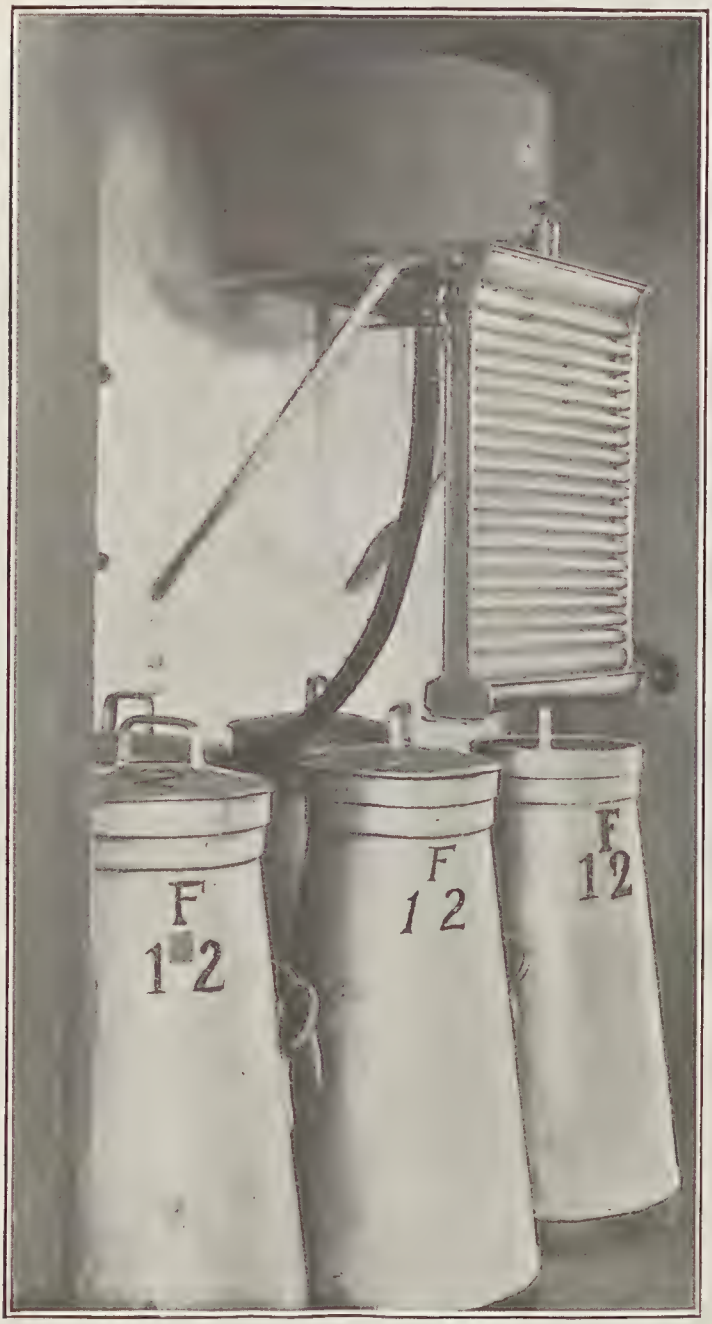
No. 2.—The Cowshed at the Nestle's Concentrated Milk Company's Farmstead.

bonemeal to them. Fifty years ago, there was plenty of clover all about Hamilton; now there is scarcely any.

The rearing of animals and the growing of crops for market exhaust the farm of phosphates, and, where the land is weak in this respect, the deficiency should be supplied, otherwise the land will be fit only for fattening store stock.

The ash of plants is only about 2 per cent. If the available stock of mineral nutrients in the soil falls below this amount, and we neglect to replenish it, then we restrict the supply of wealth from the air and sunshine. The greater bulk of the plants comes from the air and rain, and the transformation is induced by the energy from the sunshine, so that, when the growth of green blades is promoted, we literally harness the sun.

At Dennington the natural conditions favour such cycle of changes in the highest degree. Within a handy radius of the centre a large supply of milk is obtained. All the operations of the Nestle's firm are governed by pure business considerations. The suppliers must have



No. 3.—The Cooler at the Nestle Concentrated Milk Condensery, Dennington.

proper sheds and dairies, and illustration No. 1 shows a typical farmstead.

It has been forced home upon the dairy people of this district that it pays to be scrupulously clean, and the spirit of emulation has been aroused, so that numbers of the dairy folk now vie with one another in endeavouring to have the most perfect hygienic conditions. Illustration No. 2 shows a well-kept cow-shed.

The view of the cooler may serve as a reminder to many dairymen who are very remiss in the important matter of aerating and cooling milk or cream. Many taints are caused in dairy products by volatile substances which will pass off if the milk is exposed to the air. The cooling retards fermentation, and as there are cheap and effective coolers on the market, every dairyman should have one.

No. 4.—Limestone Cliffs at the Mouth of the Hopkins River.

Throughout the Dennington districts, limestone crops out on every hillside. There are great cliffs of it at the mouth of the Hopkins River. Near Allansford, there is a different class of country, with heathy sands, loams, and clay beds and ironstone gravels. Hereabouts, it has proved very profitable to top-dress the grass paddocks with the phosphatic fertilizers.

Fertility of soil depends to a large degree upon the activity of soil bacteria. Available mineral nutrients are essential to them, as to all the higher forms of life. Lime affects the chemical state of the soil and favours the presence and increase of the nitrifying bacteria. Phosphorus is essential for their vitality and activity. Therefore, the application of lime, phosphorus, and sulphur not only means the direct supply of plant-food, but the unlocking of held-up stores, and the gathering of more from the soil-air.

The milking cow is a machine, and must be supplied with the necessary fuel in the required proportions, and if she is to perform her

maximum in the way of putting the fat of the land into the bucket, she must have a ration balanced in *all* of the nutrient elements, including the hitherto neglected ash.

Mr. James Burleigh has 320 acres of land at Nirranda, a district now regularly traversed by milk-waggons from Dennington. The ground is just nicely undulating, and the soil varies from a moderately stiff loam on the lower ground to a sandy or gravelly nature on the rises. Illustration No. 5 gives a view of scrub adjoining Mr. Burleigh's holding, about 30 chains from his house.

Illustration No. 6 gives an idea of the untreated field, which has been partly cleared. The timber is a poor messmate, and the undergrowth is prickley mimosa and bracken ferns. When Mr. Burleigh took over this property from his father nine years ago, the place was rather rougher than this paddock of 120 acres is now.

No. 5.—View of Scrub Paddock thirty chains from Mr. Burleigh's House.

At that time, about sixteen cows was as much as the farm would carry, and they were very unthrifty, with frequent losses from paralysis. At present, 80 cows can be kept, and kept well. Then the income from cream was £104; now it is £834. Only 53 cows were milked this year on account of labour difficulty.

About 20 acres were cleared and ploughed each year. One or two cereal crops were grown with the aid of 1 cwt. of bonemeal per acre, and then a mixture of grasses was sown, followed by a top-dressing of 1 cwt. of Mount Lyell grass manure per acre. Subsequently, 80 lbs. per acre of bonemeal was broadcasted on by hand each season until two years ago, when a change was made to superphosphate.

The results from the use of superphosphate alone vary considerably. On the sandy loams and the black flats, it is quite satisfactory, but is not so on the ironstone formations, *i.e.*, the buckshot gravels. In the absence of lime, it probably forms unfavorable compounds with the

No. 6.—Untreated Field in which Cows Die of Paralysis.

No. 7.—Mr. A. Mathieson's Paddock.

No. 8.—Cows in the Healthy Meadow.

No. 9.—The Burleigh Homestead.

iron, and sulphate of iron is fatal to the nitrifying bacteria. On such soils, better results are obtained by using the less soluble basic phosphates. Sorrel becomes very pronounced on these ironstone soils after using superphosphate only. Liberal liming is a necessary accompaniment of the use of superphosphate on such soils.

The paddock shown in No. 7 view is occupied by Mr. A. Mathieson, and it adjoins Mr. Burleigh's land. This field has had a light dressing of 80 lbs. per acre of superphosphate for each of the past six seasons. No clearing was done, and the only other treatment was a rough harrowing each time. The grass has become thicker, while the bracken ferns have thinned out. Previously, eight miserable cows were grazed on this paddock, but to-day it keeps 36 in the best of condition, and the monthly cream cheque has increased from £10 to £80.

The grass paddock shown in illustration No. 8 was sown down seven years ago. There is now plenty of good, sweet herbage there, and the cows look well. In this field, at the time of my visit, there were to be seen quantities of those dark-green circles in the grass known as "fairy rings," which are believed to be due to the after effects of fungoid activity promoting nitrification and unlocking fertility. The rugs on the cows indicate that the owner has a keen regard for business, and conserves the energy and heat of his cows so as to obtain a full measure of butter-fat. The rows of shelter trees about the farm are further evidence of sound judgment and good taste.

The prosperous-looking and picturesque homestead may be taken as a criterion of the management. A complete answer is here given to those farmers who say that they cannot afford to buy fertilizers for their pastures. The *facts* rather show that they really cannot afford to do without them. Mr. Burleigh was determined to succeed, and, though he was carrying heavy financial obligations, bought manure for his paddocks, and slowly improved them. The tree-planting and top-dressing were the scorn of the neighbourhood; but such did not deter him, and now he has the deep pleasure of having set a good example.

A brother has made a success of a block close by, on which thirteen former occupiers had failed. This success was made possible by using phosphate for the pasture. Three miles nearer Peterborough, Messrs. Hickey Brothers have a farm on good-looking black flats, similar to the flats near Hamilton. The milch cows did very well here for a number of years, and then they lost their bloom, and began to go back and back. A few years ago, a dressing of superphosphate of about 80 lbs. to the acre was tried, and has been repeated each year since. The bone chewing, which had become very common among the cattle, has ceased, and though twice the number of cows are now kept, individually they are much more productive.

Nearer Terang, the cows owned by a dairyman showed improvement when he allowed them to drink whey brought from the local cheese factory, and for which they showed a strong liking. The great advantage to their owner through the cows' better health is further supplemented by the improvement in the pasture of his land, which is getting phosphate from the cattle's excreta, and the depleted soil is slowly being rebuilt by phosphates from the whey.

SOME FRENCH SWEET WINES.

By F. de Castella, Government Viticulturist.

In an article contributed to this journal in February, 1915, the writer advocated the making of sweet wines of lower strength than the Muscats and so-called Australian Ports, which constitute so large a proportion of the wines locally consumed. Three types were mainly dealt with, viz., Sauternes, which owes its fruitiness to over-maturity of the grapes and the judicious use of sulphurous acid; the yeast starvation wines, such as Clairette de Die and Blanquette de Limoux, and Hungarian Tokay or Tokaj. It was shown that three principles contribute, either singly or in combination, in the making of these sweet wines of moderate alcoholic strength or sweet delicate, as they were formerly termed, viz.:—

1. Over-maturity of the grapes, and fermentation at a low temperature.
2. Yeast starvation.
3. Judicious use of sulphurous acid.

It was hoped that drawing the attention of winemakers to this class of wine might lead to the conducting of experiments on a commercial scale, and ultimately to the placing on the local market of sweet wines of moderate strength. It is to be regretted that so little has as yet been attempted in this direction.

In suggesting such experiments, it is certainly not intended to discredit the sweet wines we now produce, and in which we have often reached a very high degree of quality; wines made in similar manner and of similar type to the celebrated Ports of the Alto Douro (Portugal), which rank, in the opinion of all good judges, among the world's finest wines. Nevertheless, the production of sweet wines of lesser alcoholic strength should appeal to our winemakers, if only on financial grounds, in view of the present high price of fortifying spirit, and the increased excise duty on same. The average Australian consumer insists on getting a sweet wine. If this taste can be satisfied with a wine containing 24 to 26 per cent. of proof spirit instead of 34 per cent., it is obviously better for the pocket of the producer and the health of the consumer.

It is true that these less alcoholic sweet wines do not possess quite the same "robustness" as wines of higher strength; they are somewhat more difficult to make satisfactorily, and when made they require more careful handling than the wines we now so largely produce, and which are made in quite similar manner to the true Ports of the Alto Douro. In order to make the lighter wines on a large scale, it is probable that some alterations and additions will need to be made to our wineries, mainly in the direction of more complete temperature control. An ice-making plant is an indispensable adjunct in breweries and butter factories; why not also in wineries? It is obvious that, if moderately alcoholic sweet wines can be safely made and satisfactorily handled in France and other countries, the same can be done here, though special conditions, due to our climatic differences, must be reckoned with.

Sauternes and Tokay are expensive luxuries beyond the reach of the average wine drinker. What is wanted here is something more

modest, and there are several other sweet wines made in France the study of which should prove of interest to our winemakers. The consumption of sweet wine in France is quite insignificant in comparison with that of light dry wine,* which constitutes the every-day beverage of the whole population; nevertheless, several small districts have for centuries specialized in the making of other types, and some of these have long been celebrated for their sweet or dessert wines—wines which scarcely ever contain more than 26 per cent. of proof spirit as compared with 35 to 38 per cent. proof for Port, and about 33 per cent. for Sherry. Port and Sherry, though recognised to be choice wines, do not find favour with the temperate Frenchman, who finds them too potent. He prefers wines of one or other of the types about to be described on the few occasions when he takes a glass of liqueur wine after dinner.

In the present article it is proposed to describe a few additional French sweet wines, and to briefly outline the method followed in the making of each. As will be seen, these often differ widely; there is no standardized or uniform method of making such wines. Though containing only about 26 per cent. of proof spirit, and even less, these maintain excellent condition, and are regularly handled in commercial quantities. There can be no doubt as to the possibilities in a similar direction in Australia.

It is certainly not suggested that the types of wine about to be described should be servilely imitated; let us by all means evolve new types of our own. The object of this article is to point out that there exists in Europe a wide range of sweet wines of moderate alcoholic strength of types quite different to any now made in Australia. The practical application of one or other of the methods followed in making such wines, or possibly a combination of several, will no doubt permit of the placing on the local market of wines of a type or types as yet unknown here, but types which should, owing to their smaller alcohol content, be at the same time more economical to produce, and more hygienic than our present-day sweet wines—two inducements which cannot fail to recommend themselves to thoughtful winemakers.

Australian makers of sweet wines very generally follow the Port wine method of the Alto Douro, which may be briefly summarized as

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* According to French official statistics for the 191 vintage, the last for which similar figures appear to have been published, the 3,765,816 acres under vine in bearing yielded 1,316,849,138 gallons, classified according to alcoholic strength as follows :—

Wines of less than 11° (19·19 per cent. proof)	1,209,585,564	gallons
Wines of 11°	74,113,622	,,
Wines of over 11°	33,149,952	,,
Total	1,316,849,138	,,

The above figures are for France alone, exclusive of Corsica and Algeria. It will be seen that only 2½ per cent. of the total wine production of France consists of wine containing more than 19·19 per cent proof. Exact figures as to sweet wine are not available, but much of the wine over 19·19 per cent. proof is dry wine; it thus follows that the proportion of sweet wine made in France cannot be much above 1 per cent. of the total wine production.

The proportion of choice wines to "Vin ordinaire" is also interesting. For the 1914 vintage it is estimated to have been as follows :—

Choice wines, worth over 50 fr. per hectolitre (1s. 9½d. per gallon) at the vineyard (since 1914 wine values have more than doubled in France)	27,348,134	gallons
Vin ordinaire	1,289,501,004	,,
	1,316,849,138	,,

"Vin ordinaire" is consumed when quite young. At the 1914 vintage stocks of older wines in France only amounted to 125,830,012 gallons, or scarcely 9½ per cent. of the incoming vintage.

follows:—Vintage is postponed until the must of the more or less over-ripe grape has a gravity of 15 degrees B. or over. Fermentation is allowed to proceed until the gravity is reduced to 4 or 5 degrees Beaumé, when it is entirely arrested by the addition of sufficient spirit to raise the alcohol content to from 32 per cent. to 35 per cent. proof. The stage at which the fermenting must is pressed from the crushed grapes varies according to the intensity of colour which is required—sometimes the skins are separated immediately after crushing and stemming, and before the start of fermentation; but, in the majority of cases, the must ferments on the skins, from which it dissolves colour, tannin, &c., for a period varying from 24 hours to several days. Subsequent clarification is mainly spontaneous, though filtering and fining are often practised.

This method presents several practical advantages. The sudden raising of the alcohol strength immediately paralyzes yeasts and bacteria alike; alcoholic fermentation ceases, and the development of injurious bacteria—secondary fermentations, as they are often termed—is likewise avoided. The wine remains sweet, and it also remains sound.

The most striking difference between this method and those followed by French sweet winemakers is to be found in the moment at which the spirit is added.

In the Port method the whole of the spirit is added at the conclusion of useful fermentation—in other words, when all but the remnant of sugar which it is desired to retain as such in the wine has been transformed. The cessation of fermentation is sudden and complete.

The procedure is radically different in the case of most French sweet wines. The addition of spirit is made at the commencement instead of at the close of fermentation. The cessation of this action is no longer sudden and complete, but slow and gradual.

Many French authorities are of opinion that the early addition of spirit leads to the cessation of fermentation at a lower strength than is possible with fortification at a later stage. According to Bouffard, for example, the addition of sufficient spirit to bring the strength to 12 to 14 per cent. absolute alcohol (21 to 24½ per cent. proof spirit), provided it be made before there are any apparent signs of fermentation, will suffice to impound the whole of the natural sugar of the grape. Once fermentation has started, however, it will not be arrested until a strength of 18 degrees (32 per cent. proof) has been reached; such strength being the sum of the added alcohol, plus that produced by the fermentation of portion of the sugar of the must.

As will be seen below, many French sweet wines no longer show any tendency to ferment, though their strength does not exceed 26 per cent. proof (15 degrees absolute alcohol by volume). This may surprise many of our winemakers, who generally find fortification to over 30 per cent. proof to be absolutely necessary in order to arrest fermentation. The explanation is to be found in the early stage at which the spirit is usually added.

It must also be remembered that French sweet wines ferment at lower temperatures than do ours. Even Frontignan has a cooler climate than Rutherglen, and in order to attain the requisite degree of over-ripeness, the gathering of the grapes must be long delayed—so long that frosts, and even falls of snow, are not uncommon in some parts of

France when the sweet wines are vintaged. "Fermentation must be slow, and never tumultuous; it should take place at the lowest temperature at which fermentation is possible, commencing at 20 degrees C., and later at 17 degrees C."* Artificial refrigeration would certainly enable wine to be made and handled on the Murray under exactly similar temperature conditions to those prevailing in France; and in a winery equipped with an ice-making plant, sweet wines with only 26 per cent. proof spirit could be made as easily as in that country. The ice plant is not, however, indispensable, since with the assistance of the other two factors, viz., yeast starvation and the use of a little sulphurous acid, sweet wines of 26 per cent. can certainly be made, and this at the temperatures usual at vintage time on the Murray. On the other hand, our warmer climate gives us greater facilities for vintaging over-ripe grapes; and these are indispensable in order to make high-grade sweet wines. In some French districts, especially in certain seasons, it is difficult to obtain the desired degree of over-maturity, and various devices must be resorted to. One of these consists in twisting the stalk, without, however, severing the bunch from the vine, on which it is allowed to hang for a week or so longer. Sometimes the grapes are gathered when as ripe as possible, and allowed to become over-ripe on trays or on shelves covered with straw, in a dry, well-ventilated shed, hence the name *Vin de paille* (lit. straw wine), given to some celebrated sweet wines made in the cold Jura district of France.

Even in Northern Victoria a few seasons will be remembered when ripening was not so satisfactory as usual—devices such as the above could have been applied with advantage. Even more satisfactory should prove partial drying for a day or two on wire-netting racks, such as are now so largely used at Mildura, &c., for drying sultanas and currants.

French Muscats.†

French viticultural writers have long been legitimately proud of their Muscats, of which they speak with poetic enthusiasm. Muscat De Frontignan was described by Alphonse Daudet as "the king of wines and the wine of kings." Outside of France these wines are not so well known; their production being limited they are not exported to any extent. They differ from the muscatels of Portugal and southern Spain, which are much more similar to ours, by their paler colour, greater delicacy, and lesser alcoholic strength.

In 1868 the four most celebrated Muscat growths in France were Rivesaltes, in the Department of Pyrènées Orientales; and Frontignan, Lunel, and Maraussan, in Herault. There were numerous growths of lesser celebrity such as Montbazin, Cazouls, Marseillan, Bézièrs, &c. The wines of the last two localities were at one time blended with those of Frontignan.

The quantity of Muscat made in France has never been very considerable. According to H. Marès (*Livrè de la Ferme*, vol. II., p. 190), before the destruction of Herault‡ vineyards by phylloxera, the Muscat vineyards in that Department occupied 2,000 hectares (nearly 5,000 acres), whereas the vineyards cultivating other sorts occupied no less an

* Pacottet—Article on Savagnin in Ampelographie, Vol. IV.

† For much of what follows the writer is indebted to the article on Le Vignoble et les Vins de Muscat de Frontignan, by L. Chaptal and E. Hugues, in *Progrès Agricole*, 11th May, 1913.

‡ Herault is the most important Vinegrowing Department of France.

area than 150,000 hectares (370,650 acres). Herault produces more Muscat than any other French Department. Since reconstitution, the Muscat area is considerably less. This applies not only to Herault but to the whole of France. The unfair competition of the imitation wines of *Cette* had a good deal to do with the reduced area, but it must also be remembered that in the early days of reconstitution wine was in such demand and prices so high that the Muscat districts were mainly replanted with heavy-bearing sorts, yielding *vin ordinaire;* nevertheless, Muscats are still produced, though in smaller quantity, and it appears as though many of the old Muscat vineyards will ere long be replanted. Though the produce of these vineyards is choice, their yield is poor. In pre-phylloxera days it was estimated to be about 100 gallons per acre (H. C. de Leusser). Though the method of making the wine differs somewhat from one vineyard to another, Frontignan may be taken, in a general way, to represent all these French Muscats. It is one of the oldest districts producing such wines, and is the one which is best known outside of France. In Charlemagne's time Frontignan already exported Muscats. In the thirteenth century this part of France belonged to James I., King of Aragon, who thought so highly of his Muscat wines that he visited each Frontignan vintage to personally supervise the making of the wine. The reputation of these wines was zealously guarded by the authorities. Many queer edicts were issued in the sixteenth and seventeenth centuries, with a view to keeping the quality up to the highest possible standard. Blending with cheaper wines from adjoining districts was prohibited, as was the manuring of the Frontignan vineyards, lest quantity should be forced to the detriment of quality. The date for commencing vintage was also fixed, the owners being debarred from picking their grapes until, in the opinion of the authorities, a proper stage of ripeness had been reached.

Frontignan, which has given its name to the surrounding district, is a small town situated some 14 miles south-west of Montpellier, and quite close to the sea shore. The Muscat vineyards occupy the flanks of the range of hills known as La Gardiole, which rise to a height of nearly 500 feet above the Mediterranean. On these well-exposed, sunny slopes over-maturity of the grapes is easily obtained. The soil varies somewhat. A portion of it is alluvial, of quaternary geological age, but the greater part is of miocene (tertiary) age. Both types are fairly gravelly, about 30 per cent. of the whole soil consisting of stones and gravel. The lime content is considerable. It reaches, in places, as high as 70 per cent., expressed as carbonate (=39.2 per cent. as lime, $C_{c_2}O$). These soils are remarkably rich in phosphoric acid. The vines are trained goblet or gooseberry style, and pruned to spurs with two eyes each. As is usual in Herault, they are neither staked nor trellised, nor are they summer pruned in any way.

The Muscat Grape.

The variety grown is the White Muscat, generally known by the name of Muscat de Frontignan, but which has many synonyms. This vine is now quite familiar to vine-growers in north-east Victoria, owing to extensive plantation made with vines of this variety, imported from France in 1909 and 1910. Rutherglen growers, who ordered these as grafted rootlings, were under the impression that the White Muscat of Frontignan was merely a colour variation of the vine which has long been popular in north-east Victoria under the name of Brown Muscat.

The opinion of older French authorities seemed to justify this view. Marès, for example, describes a Muscat with violet fruit, grown to a limited extent near Frontignan, which yields a "very choice and much appreciated rose coloured wine." There is also a Black Muscat in southern France, not really black, but dark reddish brown. These seem to be merely colour variations of the White Muscat of Frontignan, which is preferred in that district "owing to the fine amber colour of the wine it yields."

Our Australian Brown Muscat "sports" considerably as regards the colour of its fruit. It is not uncommon in Rutherglen vineyards to find odd vines with fruit varying from nearly white to so dark a red as to be almost black.

When the imported White Frontignan fruited, a considerable difference was soon noticed between the wine it yields and that of the Brown Muscat. The former, though fragrant and delicate, lacks the fullness, body, and very pronounced Muscat character of the latter.

It is not possible, at this stage, to decide with certainty what our Brown Muscat really is. It has long been grown in Australia, and certainly was imported very many years ago. The writer is of opinion that it is probably identical with the Portuguese Muscat, somewhat extensively grown in the Alto Douro, and also at Azeitão, near Lisbon, under the name of Muscatel Roxo. It is known in France as *Muscat rouge de Madère* (red Madeira Muscat), and is looked upon as distinct from Frontignan and the other French Muscats described above.

There are, in reality, a very large number of Muscat varieties differing more or less considerably from one another. V. Sebastien* classes them in three distinct groups, as follows:—

I. Varieties with a simple or pure Muscat flavour.
II. Varieties with an attenuated Muscat flavour, reminding of raisins.
III. Varieties with Muscat flavour, and with a perfume of orange blossom.

He looks upon White Muscat of Frontignan as the type of the first group, into which he also places early White Saumur Muscat, Muscadelle of Sauternes, and the Violet and Red Madeira Muscats. The last two, which are identical in all but colour, are probably the same as our Brown Muscat.

The second group comprises all the table Muscats, of which the type is Muscat of Alexandria, or Roman Muscat, with all its numerous subvarieties; Gordo Blanco Moscatellone of Piedmont; Salamanna of Tuscany; and Zibibo of Sicily (Zebibo in Arabic signifies raisin). Into the identity or otherwise of these sorts it is not necessary to go here. The question has given rise to much discussion, and is by no means settled.

The third group has for type the variety known as Orange-flower Muscat or Muscat de Jesus. The fruit is very delicately perfumed, though the Muscat flavour is less pronounced than in our Brown Muscat. This vine should yield very delicate and fragrant wines, although the Muscat flavour is perhaps scarcely powerful enough for this market.† The variety from which French Muscats are made is almost exclusively White Frontignan.

* Les Vins de Luxe, 1897.
† There are a few individual vines of this sort at the Rutherglen Viticultural Station, but they have not yet yielded enough to make it worth while crushing them separately.

Vintage and Making of the Wine.

High gravity musts being essential, the grapes are gathered very late—end of September or commencement of October (March and April in Australia). The following figures as to date of vintage and gravities are given by Chaptal and Hugues:—

Year.	Date of Vintage.	Degrees Beaumé.
1910 ...	22nd Sept. ...	15° to 18°
1911 ...	28th Sept. ...	18° to 21°
1912 ...	25th Sept. ...	19° to 22°

The grapes are crushed and pressed immediately, fermentation not taking place on the skins. The separated juice is then made into wine, according to one or other of two quite distinct methods, giving different results as regards the character of the wine, and also the treatment extended to it by the French Regie (Department of Customs and Excise). These are:

1. The Mistelle method.
2. The natural sweet wine method.

The Mistelle Method.*

Wines of this type are made by the immediate addition to the must of 15 per cent. of absolute alcohol before the start of fermentation.† This addition must be made immediately after the separation of the juice from the skins, and with the least possible delay. The thorough mixing of the alcohol with the must is somewhat difficult to effect, owing to the different density of the two liquids. Very energetic stirring is necessary.

Wines thus checked possess a very pronounced Muscat aroma. They acquire refinement (*finesse*) with age, whilst at the same time retaining the characteristic flavour of the grape. They are considered by the Regie (French Customs and Excise) to rank as *vins de liqueur*.‡

The Natural Sweet Wine Method.

Wines having the right to the term "natural sweet wine," and to the fiscal privileges this conveys, are defined by the French laws of 13th April, 1898, and 30th January, 1907, as follows:—These wines must be produced on the premises of the grower by the addition of alcohol to natural grape musts containing at least 14 degrees of alcohol, actual or potential (*acquis ou en puissance*). The quantity of added alcohol must not exceed 10 per cent. (absolute, by volume). The consumption tax on the added alcohol must be paid, but subsequently these wines are subject to the same fiscal treatment as ordinary wines.

The method of making the wine is as follows:—The must, which must comply with fiscal requirements, as above, is allowed to ferment spontaneously. As soon as the fermenting liquid has reached an alcohol strength of 5 degrees (8.7 per cent. proof), alcohol is added in quantity determined by calculation as sufficient to raise the strength of the mixture to 15 degrees; in other words, an addition of 10 per cent. of

* Mistelle is the French version of the Spanish term "Mistela," a name given in Spain to wines which have remained sweet owing to stoppage of fermentation by addition of spirit. In France the term is usually limited to a sweet wine, the alcohol content of which is wholly added spirit.

† This would be equivalent to fortifying at the rate of 19½ gallons of 60 over-proof spirit to each 100 gallons of unfermented must. It would immediately raise the strength to 26·2 per cent. proof.

‡ Vins de liqueur receive less favourable treatment than natural sweet wines from the French Regie (Department of Customs and Excise). In addition to paying the consumption tax on the fortifying spirit they pay a special excise duty and are subject to further restrictions when retailed.

absolute alcohol. In other words, fortification at the rate of 13.1 gallons of 60 over-proof spirit to each 100 gallons of fermenting must This fortification paralyses the work of the yeast, and arrests fermentation. This checking (*mutage*), which is not always perfect, is completed by running the wine into sulphured casks.

In addition to preferential fiscal treatment, this method presents other advantages, several fermentation products develop in the wine, notably, glycerine, volatile acids and esters, which, with age, develop special flavours which are much appreciated, amongst others, the Rancio taste. Rancio taste or *gout de Rancio* is a special nutty flavour, reminding of both Port and Madeira, which develops in certain wines as the result of oxidation. It is usually accompanied by a change to a tawny colour in a red wine.

Whether made according to the first or second of the above methods, subsequent handling is practically the same in each case. When the first cold days of winter have brought about sedimentation of the heavy lees the wine is racked. During the first and subsequent years several rackings are given annually to clear and improve the wine. It is only after three years' storage in wood that the Muscat wine is marketed. In order to obtain perfect condition it is necessary to fine and filter before bottling.

Chaptal and Hugues describe Muscat de Frontignan as—

"A very choice dessert wine (*un grand vin de dessert*); its alcoholic strength reaches 15 degrees (26.2 per cent. proof). It is of a golden-yellow colour, and has a bouquet and taste of musc peculiar to it. In order to acquire all its quality it needs at least three years' storage in cask; after this, under the influence of age, the flavour of musc diminishes, the colour lightens, and the wine possesses that smoothness and remarkable refinement of flavour which is not possessed by the Muscats of Eastern countries, and which cause it to be classed in the first rank of liqueur wines."

In Viala and Vermorel's *Ampelographie* a long article is devoted by P. Gervais to White Muscat of Frontignan. The following are extracts from the part which deals with the making of the wine:—

Although ripe about 20th August, the Muscat grapes are not vintaged until the end of September or beginning of October, by which time they have attained extra maturity and a maximum of sweetness. Picking is delayed until rather late in the morning—until fog and dew has dried off; several pickings are practised, only the ripest grapes being gathered at each. The grapes are presssed immediately, and the must is placed in *demi-muids* (puncheons of 75 gallons or over), and fortified by the addition of 3 or 4 degrees of alcohol distilled from wine (equivalent to 3.3 to 4.6 gallons of 60 o.p. spirit, to each 100 gallons of must). This addition is made with a view of paralyzing ferments rather than of increasing the alcoholic strength. Fermentation should proceed very slowly; this is favoured by shaking the puncheon filled with fermenting must at irregular intervals. Sometimes it is found necessary, during the course of fermentation, to add 1 or 2 degrees additional spirit,* in order to retain sufficient sweetness.

When the grapes are first crushed the must usually registers 18 deg. Beaumé, sometimes it exceeds 20 deg. Such vintages are great growths, really remarkable for their sweetness and smoothness. When fermentation has ceased, or almost so, the wine is racked. Rackings are repeated during the course of the first year to separate the wine from the relatively abundant lees which form each time. When clarification is complete, the wine can be bottled. It keeps indefinitely in bottle, in which it only loses any of its qualities after a very long time. The taste of musc diminishes and the wine becomes less syrupy; it still preserves that refinement and smoothness (*moelleux*) and that special aroma which place it in the first rank of liqueur wines.

* 1.1 to 2.2 gallons of 60 overproof spirit to each 100 gallons of must

The following analyses will give an idea of the usual composition of French Muscats. Though there is considerable variation, both in sweetness and alcoholic strength, it will be seen that the latter is always moderate. The strongest wine contains just under 27 per cent. proof, whilst many of the samples contain much less—even as low as 20 per-cent. proof—and yet these wines maintain their condition satisfactorily. With few exceptions, the sweeter the wine the less alcohol it contains. This is in accord with Rutherglen experience; wines made from very over-ripe grapes have been known to retain their sweetness and remain sound, though little or no alcohol was added. There seems to be a tendency of later years to use more spirit than formerly. The more recent wines usually contain rather more alcohol than older vintages.

The sulphate of potash content, and also that of sulphurous acid (SO_2), though well within the limits of pure wine legislation, are rather higher than is usual in ordinary table wines, indicating a certain amount of sulphuring (or its equivalent) during the making and handling of the wine.

Analyses of Several Samples of Muscat de Frontignan Quoted by Chaptal and Hugues.

	Made according to "Mistelle" Method.		Natural Sweet Wine.	
	Vintage, 1911.	Vintage, 1912.	Vintage, 1911.	Vintage, 1912.
Gravity, degrees B.	11·5	12·5	9·2	9·0
Alcohol, as proof spirit, per cent.	26·2	26·9	26·2	26·0
Sugar, per cent., as Glucose	25·04	30·92	21·0	19·66
Total acidity, °°/° (grammes per litre, as sulphuric	2·35	3·67	3·35	4·4
Volatile acid °°/° (grammes per litre, as sulphuric)	0·77	0·53	0·59	0·62
Total SO_2 (grammes per litre)	0·152	0·064	0·153	0·096

Analyses of Several French Muscats Quoted by P. Gervais in "Ampelographie", Vol. III., p. 383.

	Proof Spirit, per cent.	Sugar, per cent.	Total Acid, grammes per litre.	Volatile Acid, grammes per litre.	Tannin, per cent.
Muscat of Maraussan, very old ..	22·3	16·5	5·3	1·6	0·
,, ,, vintage 1859 ..	22·5	17·8	6·8	1·41	0·
,, ,, ,, 1870 ..	23·6	11·4	6·1	2·47	0·41
,, ,, ,, 1882 ..	24·9	11·2	5·5	1·76	0·14
Musat of Frontignan, vintage 1897 ..	19·3	23·7	5·31	1·44	0·09
Muscat of Lunel, vintage 1875 ..	20·6	22·1	7·34	1·84	0·19
,, ,, ,, 1898 ..	23·0	19·3	4·40	2·61	0·12
,, ,, ,, 1899 ..	17·5	34·6	5·5	1·6	0·23
Muscat of Montbazin ,, 1895 ..	25·5	6·4	5·3	2·9	0·03

Analyses of Two Samples of Muscat of Frontignan, Collected by the Writer in 1908.

(These Wines are perhaps of not quite the same high quality as the foregoing.)

	Vintage, 1896.	Vintage, 1897.
Alcohol .. .. per cent. proof	26·45	25·75
Total sugar (after inversion) .. .. per cent.	2·54	2·16
Sugar free extract .. .. „	·36	·18
Sulphates (as K_2SO_4) .. .. .. grammes per lit.	1·43	1·55
Total SO_2 .. .. mgrms. per litre	35·	25·
Free SO_2 .. .. „ „	3·	3·
Acidity—Total, as tartaric .. .. .. grammes per litre	3·6	3·4
„ Volatile as acetic .. .. .. „ „	0·5	0·4

GRADING UP THE HERD.

By R. T. McKenzie, Dairy Supervisor.

It is apparent that there is a good deal of confusion existing in the minds of most dairymen as to the general principles of breeding. If it were not so, we should see more pure-bred bulls amongst the dairy herds of the State. A large amount of money is lost annually through ignorance or indifference on the part of breeders in using "scrub sires." The principles of breeding, through the work of investigators working on Mendel's laws, have been placed on a sound basis, and the observance of mere elementals would accomplish substantial results.

The estimated yield of butter fat per cow in Victoria is about 150 lbs. per year. It is no exaggeration to say that it could be increased to 250 lbs. in the course of a few years by careful selection of dams and the use of pure-bred sires.

It was my privilege recently to visit some countries where the farmer appreciates the value of a pure-bred sire, and where many organizations, known as "Bull Clubs," are in existence for the purpose of providing approved sires, and in such countries "scrub" bulls are nowhere to be found. The advantages of this scheme are manifested in the increased returns to the dairyman as compared with our own State. The average production of butter fat per cow in Denmark is 240 lbs., in Sweden 230 lbs., and Holland the same.

Articles from time to time have appeared in this Journal stressing the importance of this question, and the Department a few years ago in a practical way, by placing pure-bred bulls in some districts for the use of settlers, showed with what importance the matter is regarded. Notwithstanding these efforts little progress has been made; in fact, some men in a position to judge claim that there has been retrogression. The average farmer aspires after no standard. He does not appear to realize that the worthless cow requires the same time, care, and attention as the profitable one, that the milking propensity is just as transmissible through the male as the female line, and in the selection of a herd bull he is easy to please.

A dairyman cannot turn his attention to a more interesting or profitable occupation than the grading up of his herd, and few fields offer more room for improvement. That this can be accomplished by the introduction of an approved pure-bred sire the whole history of breeding demonstrates. It is full of examples of how breeders have selected towards a certain standard until an animal has been evolved far superior to any of the original stock.

The dictum "that like begets like" is one of the accepted principles of breeding and generally, with some important modifications, it is true. If one consistently culls from his herd the inferior cows and uses a sire having the characteristics he desires to perpetuate, a substantial improvement must be effected. Whatever the breed, the first stage of improvement must begin with the male, because the cow has only one calf a year and her influence is limited accordingly, whereas the bull may sire all the calves in the herd if it is not a large one, exercising a powerful influence on every calf. That influence will be seen in successive generations, the good qualities of the bull becoming more firmly established, while the indifferent qualities of the original stock will become recessive.

In choosing a pure-bred bull a knowledge of his pedigree and the milking qualities of his maternal ancestors is essential. It is not sufficient to select a bull because he may be a beautiful specimen of his breed, possessing all qualifications looked for in the show ring. That is judging on appearance and indicates only about one-quarter of his value for dairying purposes. What is required in a bull of the dairy type is a combination of appearance and milking qualities, but above all, the bull intended for use in a grade herd should be selected mainly for his power to transmit to his offspring milking and butter fat propensities. Much of the future can be foretold by a study of the past. A good dam and grand-dam go a long way towards establishing desirable qualities in a bull; as a matter of fact, according to Galton's laws of heredity the influence of any ancestor further back than the third generation is infinitesimal.

No great development can take place in the dairy herd unless accurate and complete records are kept, because they form the only safe data for judging dairy cattle. Milking qualities are largely hereditary, and the progeny are likely to inherit the milking characteristics of the dam. It is therefore of fundamental importance that the dairy farmer should have a true record of the performances of his herd, so that he will be enabled to select the heavy milkers for breeding purposes. The possession of milk records is not only a valuable guide for breeding purposes, but is a good asset for sale purposes. In Denmark the price of a cow is often regulated by her milk records. The owner, through the operation of the Control Societies, is able to furnish an authentic history, not only of the dam, but of several generations, with information of milking qualities likely to be transmitted. Many cattle are sold without the purchaser having previously seen them, the purchase being determined purely through this "pedigree of performance."

In order that the improvement may be made continual from generation to generation only heifers from tested cows should be used, and with a pure-bred bull for siring, development is certain.

The writer visited a herd of cows in the south of Sweden which the owner (Mr. Lars Larsen) stated produced one-half more butter fat per year than the original cows that founded the herd. This was achieved in six years by careful selection of dams and the use of a "tested"

pure-bred bull. A "tested" bull is one that has demonstrated that he can beget offspring superior to the dams. Such a bull has a positive breeding value. "Scrub" bulls have a negative breeding value, for practically in every case the offspring give less milk than the mothers did.

In some cases, perhaps, dairymen are deterred by the high cost from purchasing a pure-bred bull, but probably no more economical investment can be made, as is shown by the following particulars obtained by the writer from Mr. F. Linde, when on a visit to his farm at Odense, Denmark. Mr. Linde purchased a "tested" pure-bred bull for £100, selling three of his cows to provide the purchase money. This bull increased the milking capacity of his daughters by 1,000 lbs. of milk and the butter-fat test .75 per year, as compared with the dam.

The dams over a period of six years averaged 5,672 lbs. of milk, butter-fat test of 3.5 per year. The daughters during a six-years' test averaged 6,680 lbs. of milk with a test of 4.25. The following table will illustrate the position:—

Cows.	Average Yearly Milk Production.	Average Butter Fat Test.	Average Yearly Fat Production.	Increase per Year of Daughters above Dams.	
				Milk.	Butter Fat.
	lbs.		lbs.	lbs.	lbs.
Dams ..	5,672	3·5	198·5	..	..
Daughters ..	6,680	4·25	283·9	1,008	85·4

The total increase for the whole herd of thirty cows for the six years was 181,440 lbs. of milk and 15,372 lbs. of butter fat. If we estimate the value of butter fat at 1s. per lb. the extra yearly income was £128 5s., or a total for six years of £745 10s. The average yearly return of the dams was £9 18s. 6d., for the daughters £14 4s.—a difference in favour of the latter of £4 5s. 6d. Who will say that this pure-bred bull did not show a handsome profit? The records of the daughters do not show altogether the full value of this bull, for his influence on the subsequent generation must be taken into account; his grand daughters inherited his milking qualities and added very materially to the productiveness of the herd.

Many similar instances showing the value of a pure-bred bull could be quoted. The sooner dairymen discard the mongrel sires at present in use and replace them with pure-bred animals—and the Government herd-testing records makes a wide choice possible—the sooner results will be obtained that more nearly approximate those of the other great dairying countries of the world.

FLUCTUATIONS IN THE EGG MARKET.

(By A. V. D. Rintoul, Assistant Poultry Expert, N.D.D.)

There can be very little doubt that we shall have to accustom ourselves—for some years at any rate—to a fresh range of prices so far as labour, building materials, and foodstuffs are concerned. Five years of not merely non-production, but of colossal destruction, with an appalling wastage of human life, must necessarily account for a largely

increased demand for—with consequent scarcity of—labour and raw material.

Increased production can therefore best form the solution of whatever difficulties and changes we may have to face, this production being coupled with improved methods of marketing, backed up by a definite and comprehensive scheme of co-operation.

Nothing particular is wrong with the poultry industry, any troubles being entirely attributable to the indiscretions of some of those actually engaged in the business. Poultry-keeping—the chief objective of which is egg-farming—is primarily a rural industry—preferably a side line—to general farming. No one would suggest Toorak for wheat farming, nor St. Kilda as a site for an orange grove—yet because from time to time some misguided person fails to make a success of poultry-keeping on highly-priced building land virtually within the "brick" area, the press is inflicted with complaints about the industry. Decentralization and close co-operation are necessary.

It was stated in a recent American publication that if every farmer would keep 120 birds on his farm the revenue from these birds would be worth 1,250,000,000 dollars a year to the United States. Already the Victorian poultry returns compare favourably with those in America, being about 32s. 6d. annually per head of the population, as against 30s. in the States; and our returns could be more than doubled by the establishment of a poultry plant on every farm, which could be operated in a small way without additional labour, and with the advantage that *on the farm the cost of producing a dozen eggs would be about half the cost involved in the metropolitan suburban area,* where all foodstuffs have to be bought generally at top retail prices.

Lack of proper co-operation is a very serious bar to success, poultry-keepers invariably viewing an organised attempt at co-operation with considerable suspicion.

In view of the fact that the majority of poultry-keepers require regular payments from the sale of their eggs, and to enable them to reap the full advantage of the very high prices likely to prevail this coming autumn and winter for eggs, the Cabinet recently made the sum of £5,000 available as an advance against eggs placed in cool storage, and chamber space was reserved which, perhaps, might have been more profitably set aside for meat. It must for ever remain a remarkable fact that not one egg farmer has taken advantage of one penny of this proffered loan! When the grant was first made eggs were selling at from 11d. to 11½d. per dozen, and the cool storage proposition showed every prospect of a net profit of 8d. or so a dozen, or at least 15s. a case. One selling agency alone had an order for 6,000,000 eggs for an individual speculator who was willing to step in where the poultry farmer (aided by a Government loan) was afraid to tread. Now we read in the press that because wheat has risen, innumerable five-guinea birds are being sold for table purposes!

It would require very little co-operation on the part of the commercial egg farmers to control the market all the year round and insist on a fair price commensurate with the cost of production, instead of leaving the question of price to the dealers, who at present dictate to the industry. The Railways Classification Board has just fixed 11s. 9d. a day as the minimum wage for the lowest grade porter. If the poultry-keeper is to accept this humble sum as his daily wage for seven days' work a week, he will require 1d. per week per bird—on a 1,000-bird

flock basis—to pay his wages, and another ½d. per bird per week for housing and equipment, besides a return for food, before any profits can be derived. A simple calculation may be made to determine the daily egg yield required to pay for the actual food consumed as follows:—

X = cost of 100 lbs. weight of grain and meal.

Y = price received for one dozen eggs.

$\frac{X}{Y} \times 3$ gives the daily yield for 100 birds to pay feed bill.

If, therefore, 100 lbs. of food costs 12s., and eggs are worth 1s. 6d. per dozen,

100 birds must lay $\frac{12s.}{1s.\ 6d.} \times 3$, *i.e.*, 24 eggs daily to meet their feed bill.

On this basis breeders could fix a range of wholesale prices from, say, 1s. 3d. per dozen in the spring, to 2s. in the winter, and all surplus eggs could be exported.

Just at present America presents a very attractive field for the export of eggs, as owing to the rate of exchange so far as money is concerned, 30 per cent. will be added to the selling price.

One is almost weary of repeating the fact that eggs laid in the spring time during the glut period can be exported so as to arrive overseas at the time of scarcity.

When the price of wheat goes up, bakers automatically raise the price of bread, yet, we were recently treated to the spectacle in a neighbouring State of pastrycooks trying to prohibit the export of eggs *in order to keep the price down*. Could anything more ridiculous be conceived?

During the last twelve or thirteen years the prices received by poultry-keepers have increased enormously. In January, 1907, eggs brought only 6½d. per dozen, as against 1s. 7d. in January, 1920, whilst for table poultry 6d. per lb. live weight was looked upon as a very satisfactory price, whereas chickens are now fetching from 1s. to 1s. 2d. per lb. at auction. Thus even if the cost of foodstuffs has doubled the poultry farmers' returns for both eggs and meat have doubled also.

Close co-operation amongst the commercial egg farmers is much more difficult to achieve than it appears. In the first place the great boom in egg-laying competitions in this State is grossly exaggerating the value of mere scores, and the industry is largely controlled by stud-breeders. While the stud-breeder is entitled to his place in the sun, it should never be forgotten that the commercial egg farmer is the mainstay of the industry. Without him the stud-breeder would soon find himself in difficulties; therefore, a fair price for eggs—taking into consideration the cost of production—should be the slogan for all members of the National Utility Poultry Breeders' Association.

A very determined effort should be made to pool and place to the best advantage all the new laid eggs during next August, September, and October. With wheat selling at about 8s. 4d. per bushel delivered (retail price), and other foodstuffs in proportion, it must cost 3d. per week to feed each bird. At least one penny per week must be allowed for labour and equipment, so that eggs should average fully 1s. 8d. per dozen throughout the year if the egg farmer is to receive the return to which he is entitled.

Wholesale Price of Eggs in Melbourne for Past Thirteen Years.

	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
1st January	0 6½	0 7	0 10	0 10	0 9	0 9	0 10	0 10½	1 0	1 3	1 0½	1 0	0 11	1 4½
15th „	0 6	0 7	0 10½	0 9	0 9½	0 8¾	0 10	0 10½	1 0	1 3	1 0½	0 11	0 11	1 5
1st February	0 6	0 8½	0 11½	0 11	0 9	0 11	0 11	1 2	1 4	1 6	1 2	1 0	1 1	1 6
15th „	0 9½	0 9	0 11	1 0	0 11½	0 11½	1 0	1 3	1 4	1 8	1 6	1 2	1 3	..
1st March	0 10	0 10	0 11	0 11	0 10½	1 0	0 11¼	1 3	1 5	1 6	1 4	1 4	1 5	..
15th „	0 10½	0 10	1 0	1 1	0 11	0 11½	0 11	1 2	1 8	1 8	1 4	1 4½	1 6	..
1st April	1 0½	1 2	1 2	1 2	1 1	1 1	1 3½	1 5	1 11	1 10	1 6	1 6	1 6	.
15th „	1 2	1 5	1 3	1 2	1 4½	1 4	1 4	1 8	2 0	1 11	1 9	1 7¾	1 8	..
1st May	1 2	1 5	1 8	1 5	1 5½	1 7	1 6	1 8	1 10	2 3	1 10	2 0	2 0	.
15th „	1 4	1 6½	1 6	1 6	1 6	1 8	1 7	1 9	1 10	2 0	1 10	1 10	2 0	..
1st June	1 4	1 8	1 5	1 6	1 6	1 7	1 4½	1 10	2 0	2 0	1 10	1 10	2 0	..
15th „	1 3	1 4	1 7	1 3	1 7	1 5½	1 4½	1 6	2 0	1 8	1 6	1 10	1 10	..
1st July	1 1	1 4	1 2	1 4	1 3	1 6½	1 3	1 3	1 8	1 6	1 3	1 5	1 6	.
15th „	0 10	1 4	1 3	1 3	1 1	1 5½	1 1	1 4½	1 8	1 7	1 4	1 3	1 7½	..
1st August	1 0	1 0	1 0	1 2½	0 11½	1 4½	1 1	1 4½	1 8	1 2	1 1	1 4	1 7	..
15th „	0 9	0 11	0 11½	0 10½	0 9¾	1 0	0 10½	0 9½	1 5	1 0	0 11½	1 2	0 11½	..
1st September	0 8	0 10	0 8	0 9½	0 9½	0 10½	0 10½	0 10½	1 5	1 0	0 9½	0 10	0 11½	..
15th „	0 8	0 9	0 9	0 9	0 9	0 11	0 11	0 10	1 2½	0 10	0 9½	0 10	1 0½	..
1st October	0 8½	0 10½	0 9	0 8	0 8¾	0 11	0 10	0 9½	1 3½	0 10½	0 9½	0 10½	1 2½	..
15th „	0 8½	0 10	0 9	0 7½	0 8¾	0 11	0 9½	0 10	1 4	0 10½	0 9	0 9½	1 2½	..
1st November	0 9½	0 9½	0 9	0 8	0 9	1 0	0 9½	0 10	1 4	0 10½	0 9	0 10½	1 2½	..
15th „	0 9½	0 10½	0 8½	0 8½	0 9½	0 11	0 9½	0 10	1 4	0 11½	0 8½	0 10½	1 3	..
1st December	0 9	0 10	0 8	0 9	0 10	1 0½	0 10	0 11	1 5½	0 11½	0 10	0 11	1 4½	..
15th „	0 9½	1 0	0 10	0 9½	0 9¾	1 0½	0 10½	1 4	1 5½	1 0½	1 0	0 11	1 4½	..
Range of prices	6d. to 1s. 4d.	7d. to 1s. 8d.	8d. to 1s. 7d.	7½d. to 1s. 6d.	8¾d. to 1s. 7d.	8¾d. to 1s. 8d.	9½d. to 1s. 7d.	9½d. to 1s. 10d.	1s. to 2s.	10½d. to 2s. 3d.	8½d. to 1s. 9d.	9½d. to 2s.	11d. to 2s.	..

FARM NOTES FOR JANUARY.

RUTHERGLEN EXPERIMENT FARM.

P. B. O'Keefe, Manager.

Following the heavy downpour of rain in December, 1919, weather conditions in January were very dry, 17 points of rain only having fallen during the month.

The growth among stubbles and summer varieties of grass, however, remained succulent, and assisted materially in maintaining the health and condition of live stock. Stubble land is in good condition for working, therefore good headway has been made with ploughing and the cultivation of fallows in preparation for approaching seeding time.

Grading of seed wheat for sale to farmers is progressing satisfactorily, the sample being very clean and bright. It is possible to increase production by adopting more rational methods, and in this connexion there is nothing more important than the careful selection of the seed. Not only the quality of the seed should be studied, but also its suitability for the conditions prevailing in the district where planted, its suitability for the purpose for which the resultant crop is intended, and the time of sowing. Speaking generally, the experience gained here goes to show that the undermentioned wheats are suitable under varying conditions as follows:—For early and mid-season sowing, for grain, Yandilla King and Federation; for late sowing, early maturing varieties, such as Gluyas and King's Early; for hay or feeding-off, Warden, planted early, or King's Early, late sown. The last-named wheat, however, being bearded and weak in the straw, is not regarded with favour by the average farmer.

The selection of wheat for seed on this farm commences when the plants are in the stud cereal area. The best heads are selected, and the resultant seed from these graded and planted out in successive seasons. Five years are required to produce the bulk supply sold to farmers. Each season just prior to harvest all areas are carefully inspected and any plants showing a variation from the true type, as well as strange wheats accidentally introduced, are picked out by hand. In addition to this, all machinery, harvesters, headers, strippers, grader, &c., are scrupulously cleaned after each variety. The amount of extra labour and expense put into the preparation of this seed wheat makes it impracticable to supply large quantities of seed to individual farmers. Farmers would be well advised each year to set aside a small area of clean fallow and purchase sufficient high-class seed for the area, using the grain produced for their wheat fields the following season. In this way they would be always assured of a good supply of pure seed of heavy producing quality.

Cultural Operations.

One hundred and eighty acres have been ploughed since the beginning of the year, in addition to 200 acres of fallow, on which summer crops of rape and millet were sown. The fallows are being actively worked to conserve moisture and to prepare for seeding.

Stock.

Teams are in good healthy condition and practically free from harness galls, and appear quite equal to the task ahead for the next few months.

Dairy Herd.

Two cows have come into profit during the month, both dropping heifer calves. One of these cows, usually a heavy milker, has developed udder trouble, and may have to be fattened off. The second cow—a Shorthorn cross—is doing well, having yielded in sixteen days since coming in 763 lbs. milk, with a 4 per cent. test. The average yield of herd per head for the month was 64 gallons, with a 4.2 test, whilst the value of produce sold was £1 9s. 2d. per cow. Fodder consists of chaff, damped with molasses, with a dust of bran added, green maize, sorghum, and natural pasture. One fat dry cow was sold for £18. Young stock are in excellent condition. Grown steers have put on a lot of flesh, and will be marketable at an early date.

Sheep.

Breeding ewes are all in good thrifty condition. Weaners are doing remarkably well, about 75 per cent. being in prime condition. All four and two tooths Border Leicester ewes have been mated with ram "Kelso Douglas," imported from New Zealand.

EXPERIMENTAL PLOTS, STATE RESEARCH FARM, WERRIBEE.

G. S. Gordon, Field Officer, State Research Farm, Werribee.

General.

Abnormally cool, and even cold weather, was experienced during January. The highest air temperature recorded was 94 degrees F., and the lowest 44 degrees F. The rainfall amounted to 125 points, 93 of which fell in the last week.

Another cultivation of the fallow sections will be undertaken in an endeavour to combine as much of this moisture as possible with that already conserved in the soil for the use of the next crops. The cool season has somewhat retarded the growth of lucerne, but has helped summer crops of rape, while the rain has benefited both and enabled ploughing to be done under better conditions.

Meteorological Observations.

On page 120 will be found a summary of the meterological observations recorded during 1919, together with previous average records. A few of the outstanding features contained in the summary may be particularized as follows:—

1. *Rainfall.*—The figures for the years prior to 1913 have been taken from the only record kept up to that time in the district, and they show that for a period of 42 years the average annual rainfall amounted to 20.19 inches. The first six years' record taken at the farm gives an average of 19.01 inches, or more than 1 inch less. In 1919 the rainfall amounted to 20.69 inches, being greater than either of the above averages; but notwithstanding this, the year was regarded as a comparatively dry one in the district, and the crops were much below the average. This is accounted for by the fact that nearly 14 inches of the rain fell outside the growing period of cereal crops, and only 6.97 inches from 1st May to 31st October. These figures, in conjunction with harvest yields, not only point to the benefit of a good distribution of the rain, but to the possibilities of moisture conservation by fallowing.

Had the total amount been better distributed there would have been ample for the requirements of heavy crops.

2. *Bright Sunlight.*—This is somewhat lower than usual, but it is interesting to note that at Werribee—in "Sunny Australia"—the bright sunlight averages slightly under five hours per day for every day of the year.

3. *Evaporation.*—This, too, is lower than the average for the previous five years, although it indicates that in twelve months almost 4 feet of water would be removed by evaporation from all dams and exposed water surfaces in the district.

4. *Air and Soil Temperatures.*—These are of interest and value in comparing the results from various experiments from year to year, and have a direct bearing on the growth of all plants.

Barley Variety Tests, 1919.

The harvest yields from these plots are recorded in Table No. I., and although they are comparatively low, they are quite as good as might have been expected under the seasonal conditions. The two-rowed malting barley Pryor, in particular, has done well under the dry conditions, with a yield of 21 bushels 6 lbs. per acre. This variety has given consistently good yields, and besides being fairly early, its fine pliable straw enables it to withstand wind and rain better than most barleys of its type. No. 36 has also given a better yield than the check plots of Cape barley. It is a six-rowed barley of the Cape type.

Table No. I.

Barley Variety Tests 1919.

Sown on well-worked fallow in Field No. 14, S.E., on 14th to 18th June, 1919; 70 lbs. graded seed, pickled with 1½ per cent. solution of bluestone, sown with 120 lbs. super. per acre. Harvested 17th-18th December, 1919.

Rainfall during growth, 5 inches; plot area, ⅛ acre.

Plot No.	Variety.	Plot Yield.	Yield per Acre.	Remarks.
		lbs.	Bushls. lbs.	
1	Cape	95	15 10	Some grain lost through bad stripping
2	W4011D, Roseworthy Oregon × Californian Feed	97	15 26	
3	Roseworthy Oregon	75	12 0	
4	Chilian C	75	12 0	
5	Chilian D	74	11 42	
6	Barley No. 36	118	18 44	
7	Barley No. 49	79	12 32	
8	Primus	64	10 12	
9	Pryor	132	21 6	
10	Cape	105	16 40	
11	Crossbred 1 $\frac{b6}{2}$	83½	13 18	

Meteorological Observations at Werribee.

Summary of observations made during 1919, and comparison with averages for previous years :—

Rainfall.

Average annual rainfall for forty-two years prior to 1913 .. = 20·19 inches
Average annual rainfall for period 1913 to 1918 (6 years) .. = 19·01 ,,
Rainfall during 1919 (536 points in March and 358 points in December) = 20·69 ,,

Bright Sunlight.

Average annual total during five-year period, 1914 to 1918 = 1,848·4 hours = Daily Mean, 5·0 hours.
Total during 1919 .. = 1,673·9 ,, = ,, 4·6 ,,

Evaporation.

Average annual total from free water surface during five-year period, 1914–1918 = 47·079 inches
Total during 1919 .. .. = 46·120 ,,

Mean Air Temperatures.

Period.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Mean of Max. and Min.
Average for 5 years, 1914 to 1918	58·3° F.	54·0° F.	67·2° F.	48·1° F.	57·6° F.
During 1919 ..	59·2° F.	53·7° F.	67·7° F.	49·6° F.	58·6° F.

Mean Soil Temperatures.

Period.	At 1 Inch.		At 6 Inches.		At 12 Inches.		At 24 Inches.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
Av'ge for 5 years, 1914 to 1918	70·0° F.	51·4° F.	62·3° F.	53·8° F.	60·°2 F.	55·6° F.	59·2° F.	57·1° F.
During 1919	69·6° F.	53·6° F.	62·5° F.	55·3° F.	60·2° F.	55·5° F.	59·3° F.	56·9° F.

Mean of Maximum and Minimum Soil Temperatures.

Period.	At 1 Inch.	At 6 Inches.	At 12 Inches.	At 24 Inches.
Average for 5 years, 1914 to 1918	60·8° F.	58·0° F.	57·9° F.	58·1° F.
During 1919	61·6° F.	58·9° F.	57·8° F.	58·1° F.

Oat Variety Tests, 1919.

The yields from these plots are given in Table No. II. hereunder, from which it will be seen that the well-known variety, Algerian, has held its own very well. The only variety to beat the average yield of the two check plots was Mortgage Lifter. This variety—which is very like Algerian in appearance—was included in the tests for the first time.

Table No. II.

Oat Variety Tests.

Sown on well-worked fallow in Field No. 2, N.E. Seed, 61 lbs. per acre; sown on 27th May, 1919, with 120 lbs. super. per acre. Plot area, $\frac{1}{16}$ acre. Crop harvested 9th December, 1919.

Rainfall during growing period, 6 inches.

Plot No.	Variety.	Plot Yield.	Yield per Acre.	Remarks.
		lbs.	Bushls. lbs.	
1	Algerian ..	38	15 8	Slightly damaged by rain-storm
2	Mortgage Lifter	43	17 8	Not quite so badly damaged as Algerian
3	Argentine ..	36	14 16	Badly laid by rain-storm
4	Guyra ..	31	12 16	Practically all tangled and laying on ground by rain-storm
5	Lachlan ..	39	15 24	Also damaged, but not so badly as Guyra
6	Sunrise ..	26	10 16	Slightly damaged, but not quite so much as Algerian
7	Glen Innes ..	22½	9 0	Very badly damaged by storm
8	Algerian ..	44	17 24	Slightly damaged by rain-storm

Permanent Manurial Field, 1919.

The yields from the plots in this field are recorded in Table No. III. They again point to the advantages to be obtained from the rational use of fertilizers, the outstanding feature being the benefit derived from the use of fertilizers containing water soluble phosphate. The plots fertilized with superphosphate show a gradually ascending yield from the various applications right up to the heaviest dressing of 2 cwt. per acre. The results from the superphosphate-dressed plots for 1919, and the average for these plots during the past five years (1915 to 1919 inclusive) may be summarized thus:—

Yields from Plots Treated with Superphosphate.

Plot No.	Treatment per Acre.	Yield per Acre in 1919.	Average Yield per Acre for Five Years 1915–19.
		Bushels lbs.	Bushels lbs.
4	No manure	2 0	7 12
5	½ cwt. of superphosphate	7 36	12 13
10	1 cwt. of superphosphate	14 48	14 14
6	1½ cwt. of superphosphate	17 40	14 33
7	2 cwt. of superphosphate	18 16	14 30

The increase from 2 bushels per acre on the unmanured plot to 18 bushels 16 lbs.—over nine times as much wheat—on the plot which received 2 cwt. of super. per acre, is remarkable; but the average yield for five years, though not showing such a wide range, may be considered a more reliable guide. Here the yield ranged from 7 bushels 12 lb. on the unmanured plot to 14 bushels 33 lb. on that which received

1½ cwt. of super. The return from the plot given ½ cwt. of super. was 5 bushels 1 lb. more than that from the unmanured plot; 1 cwt. increased the amount to 7 bushels 2 lbs., and 1½ cwt. gave the still greater increase of 7 bushels 21 lbs. per acre. Taking the value of the increased yield due to the fertilizer at 4s. per bushel, the following figures are arrived at:—

½ cwt. super. costing 2s. 6d. produced extra wheat worth 20s. or 17s. 6d. net profit per acre.

1 cwt. super. costing 5s. produced extra wheat worth 28s. or 23s. net profit per acre.

1½ cwt. super. costing 7s. 6d. produced extra wheat worth 29s. 4d. or 21s. 10d. net profit per acre.

Thus the 1 cwt. dressing gave the greatest net profit per acre, but taking into consideration the proved benefit of the residual effect on the pastures following the crop, the heavier dressings—up to at least 1½ cwt.—would seem to be the more profitable at Werribee.

Table No. III.

Permanent Manurial Field.

Harvest Results—Season 1919.

Crop, Yandilla King wheat; 68 lbs. graded seed, sown 30th and 31st May. Harvested 3rd January, 1920.

Plot No.	Treatment per Acre.	Plot Yield.	Yield per Acre.	Remarks.
		lbs.	Bushls. lbs.	
1	Superphosphate, 1 cwt.	160	10 40	
2	Farmyard manure, 10 tons ..	168	11 12	
3	Farmyard manure, 10 tons + lime, 10 cwt.	189	12 36	
4	No manure	30	2 0	
5	Superphosphate, ½ cwt.	114	7 36	
6	Superphosphate, 1½ cwt.	265	17 40	
7	Superphosphate, 2 cwt.	274	18 16	
8	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt., at seeding time	188	12 32	
9	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt., top-dressed in spring	242	16 8	
10	Superphosphate, 1 cwt.	222	14 48	
11	Superphosphate, 1 cwt. + sulphate of potash, ½ cwt.	207	13 48	Sown on well-worked fallow; one crop in two years
12	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt., and sulphate of potash, ½ cwt.	159	10 36	
13	Bone fertilizer, 1 cwt.	74	4 56	
14	Thomas' phosphate, 1 cwt. ..	98	6 32	
15	Superphosphate, ½ cwt. + Thomas' phosphate, ½ cwt.	162	10 48	
16	Superphosphate, 1 cwt. + lime, 5 cwt.	176	11 44	
17	Superphosphate, 1 cwt. + lime, 10 cwt.	195	13 0	
18	Superphosphate, 1 cwt. + lime, 20 cwt.	227	15 8	
19	Superphosphate, 1 cwt.	179	11 56	
20	No manure (continuously cropped)	48	3 12	Sown on stubble land every year
21	Superphosphate, 1 cwt. (continuously cropped)	138	9 12	

THE PERMANENCE OF LUCERNE.

Investigations regarding the essential factors governing the successful cultivation of lucerne under irrigation have been one of the most satisfactory and encouraging of the many series of experiments carried out at the State Research Farm. The results from some of these have been published in this *Journal* from time to time, and the knowledge has been put into practice in cultivating the bulk areas on the farm,

1.—This stand of lucerne is now seven years old. In its second season (1914) it gave 6½ tons of hay per acre, besides winter grazing. This illustration, taken on the 9th January last, shows the third cut for the present season.

2.—A view taken from about the same spot as was the illustration above. This picture was taken during the second season (1913-14).

and the crop has proved so valuable that the lucerne areas have been gradually increased until they now amount to over 200 acres. Under favorable conditions lucerne is known to continue profitable for many years, and some of that growing on the Research Farm is now seven years old.

The following brief account and accompanying photographs will serve to indicate the permanence and usefulness of the crop. The first paddock sown contained an area of 50 acres, on 15 of which the lucerne

is now seven years old, and on the balance six years. The treatment of and results from the yield have been carefully recorded during these periods, and the history of the oldest portion may be summarized as follows:—

The soil is a reddish clay loam, resting on a stiff clay subsoil, and through prior continuous cultivation (chiefly for oaten hay) it is deficient in humus and phosphates.

3.—Returned Soldier Trainees cocking Lucerne at State Research Farm, Werribee. This field was sown in 1912.

4.—Lucerne six years old. Third crop for 1919-20 season, showing twenty days' growth.

The field was sown with Tamworth lucerne seed in October, 1912, and gave three light cuttings and winter grazing for 56 ewes and lambs for eight days up till 30th June, 1913.

From this on it has consistently given heavy yields, ranging from four to six cuttings per year, varying with the season and water supply, and has also provided grazing each winter equivalent to about two sheep per acre *for the whole year.*

In its second season—1913-14—it produced six cuttings, totalling 6½ tons of hay per acre. One of these is depicted in Illustration No. II. During the present season three heavy cuttings have been harvested to date from the same area, and the fourth is now growing vigorously. The crop from the third cutting this season is shown in Illustration No. I., and comparing this crop together with the thick, healthy, clean lucerne now growing, with the crop shown in Illustration No. II., which was taken in the second season, and from about the same location as No. I., it is quite evident that the stand is not only quite as good to-day as it was in 1914, but that there is every indication it will continue to give profitable yields for some years to come.

The main items which have materially helped to obtain the fine stand and maintain its productivity are :—

A. Preliminary work.

(1) Subsoiling and careful grading to permit of an even distribution of the irrigation water and yet prevent water logging.

(2) Careful preparation of the soil in order to insure good germination and a clean seed bed.

(3) The application of 1 ton of lime per acre.

(4) Sowing the seed (Tamworth, which is very similar to Hunter River lucerne) at the rate of 16 lbs. per acre, 8 lbs. being mixed with 1 cwt. of super. per acre immediately before sowing, and drilled very shallow each way. This insures an even distribution of the seed and a good stand if the other conditions are right.

B. Maintenance of the Stand.

(1) Thorough renovation of the field by cultivating it at the end of each winter grazing period—about August—in two directions at right angles to each other, with a narrow diamond-pointed rigid-tyned cultivator. This breaks up the hard surface crust caused by irrigation, aerates the soil and keeps the stand free from weeds.

(2) Top-dressing with 2 cwt. superphosphate per acre after the above cultivation, so as to supply some of the mineral plant food which such heavy crops necessarily remove from the soil.

(3) Harrowing and rolling after drilling in the super. to further break and "set" any clods, and thus prevent them being raked up with the first "cut" for the season.

(4) Careful irrigation, cutting, and grazing.

At first sight the cost of preparing, grading, and seeding land to lucerne is generally considered high, but a crop which gives such remarkable results over a long period is worthy of every possible attention in its initial stages. The success and permanence of the crop, as well as the economical handling of the water, very largely depend on this work, and when the cost is spread over the period which a well-established

field should last, the cultivation, &c., works out at a comparatively low annual amount per acre.

Lucerne may be said to be the mainstay of irrigated agriculture in its early stages, and an important factor in promoting the prosperity of any district in which it can be extensively grown. When most other crops and pastures are parched and dry in summer, it is pleasing to see the extensive fields of green succulent lucerne providing immediate feed for stock as well as giving promise of a fine "cut" of hay for the winter months. The heavy "cuts" now being obtained at the Research Farm seven years after seeding should remove any possible doubt regarding the permanence of the crop in the Werribee district, and tend to confirm the opinions often expressed by enthusiastic lucerne growers to the effect that it is the "king of fodders" and the greatest mortgage lifter and soil renovator known amongst farm crops.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Young Trees.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

Fumigation.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, if the foliage of the trees be thoroughly dry.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

Horses.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

Cattle.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the dropping, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available.

Pigs.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now.

Sheep.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks, if autumn be favorable, for ewes with early-born lambs. Where possible, castrate the ram lambs immediately. Good prices will be available for this class again this winter.

Poultry.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

CULTIVATION.

Farm.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

Orchard.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

Vegetable Garden.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

Flower Garden.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

Vineyard.—Select scions, if not done last month. In cooler districts, where ripening is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price 6s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

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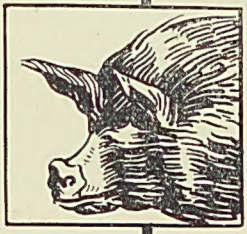

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